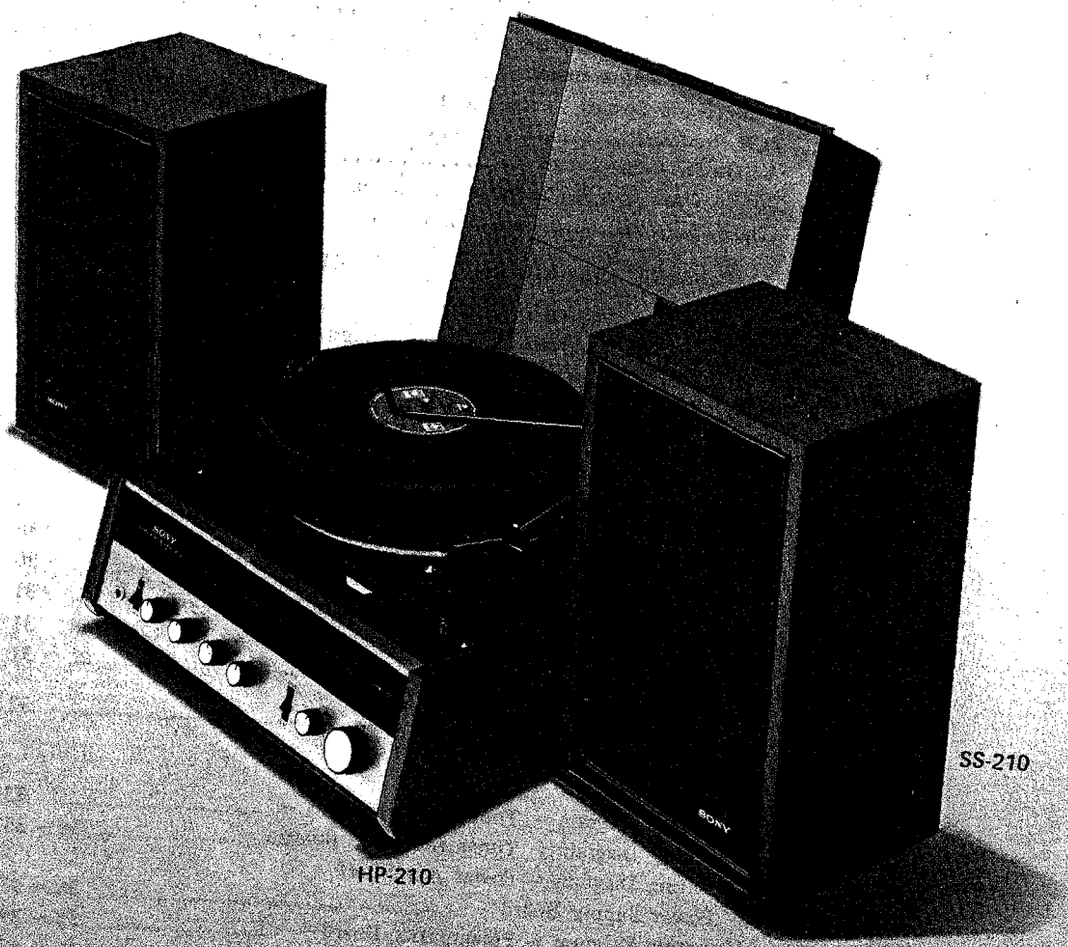
HP-210

ISO

Set using ISO screws



SS-210

HP-210

SONY®

SERVICE MANUAL

2357

TABLE OF CONTENTS

	Title	Page
SERVICING NOTES		1
SECTION 1	TECHNICAL DESCRIPTION	
1-1.	Technical Specification	2 ~ 3
1-2.	Circuit Analysis	3 ~ 7
1-3.	Block Diagram	8
1-4.	Level Diagram	9
SECTION 2	DISASSEMBLY AND REPLACEMENT PROCEDURES	
2-1.	Tools Required	10
2-2.	Hardware Identification Guide	10
2-3.	Top Cover Removal	11
2-4.	Record-Changer Removal	11
2-5.	Front Panel Removal	12
2-6.	Wooden Case Removal	13
2-7.	Dial-Cord Restringing	13 ~ 15
2-8.	Mechanical Dial Calibration	15
2-9.	Pilot Lamp Replacement	16
2-10.	Control and Swtich Replacement	16 ~ 17
2-11.	PCB Removal	17
2-12.	Ac Outlet Replacement	17
2-13.	Power Transistor Replacement	18
2-14.	Chassis Layout	18
SECTION 3	ALIGNMENT AND ADJUSTMENT PROCEDURES	
3-1.	FM I-f and Discriminator Alignment	19 ~ 21
3-2.	FM Frequency Coverage Alignment	22 ~ 23
3-3.	FM Tracking Alignment	23
3-4.	A-m I-f Strip Alignment	25 ~ 26
3-5.	A-m Frequency Coverage and Tracking Alignment	26 ~ 28
3-6.	Power-Amplifier Adjustments	28 ~ 29
SECTION 4	RECORD CHANGER SERVICING PROCEDURES	
4-1.	Line-Frequency Change	30
4-2.	Line-Voltage Change	30
4-3.	Cartridge Replacement	31
4-4.	Stylus Tip Replacement	31
4-5.	Stylus Pressure Adjustment	31
SECTION 5	REPACKING	32
SECTION 6	DIAGRAMS	
6-1.	Mounting Diagram – Tone Control Board –	33
6-2.	Mounting Diagram – Tuner and MPX Board –	34 ~ 35
6-3.	Mounting Diagram – Power Amplifier/ Power Supply Board –	36 ~ 37
6-4.	Mounting Diagram – Preamplifier Board –	38 ~ 39
6-5.	Schematic Diagram – Tuner and MPX Section –	41 ~ 42
6-6.	Schematic Diagram – Audio Amplifier Section –	43 ~ 44
SECTION 7	EXPLODED VIEW	45 ~ 47
SECTION 8	ELECTRICAL PARTS LIST	48 ~ 52

SERVICING NOTES

1. Be certain that the lead wires (blue) for the dial lamp are affixed to the front subchassis with electrical tape, otherwise hum will be picked up at the preamplifier stage. See Fig. A.
2. Be certain that the discriminator transformer shield is reinstalled, otherwise hum will be picked up from the record changer motor. See Fig. B.
3. In this set, "wire-wrap" connections are employed as shown in Fig. C. In case a wire breaks, simply solder the lead wire directly to the terminal post.
   Wire-wrap connection cannot be properly made by hand.
4. Care should be taken not to cut too deep when removing the insulation from wire.
   Even the slightest nick in the copper wire will weaken the wire enough to eventually cause a break at that point. Use a soldering iron to remove the insulation.

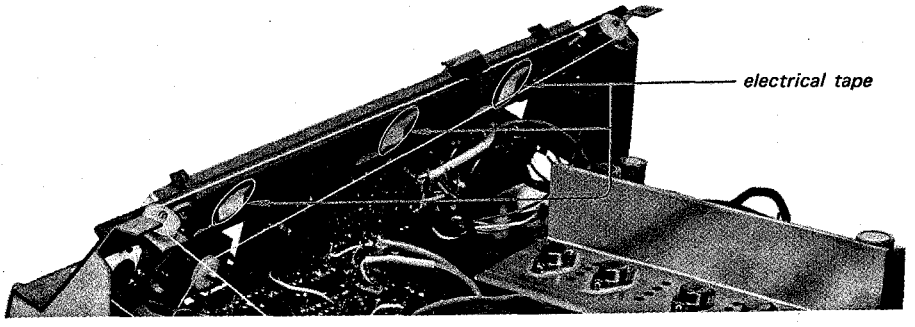


Fig. A Affixing lead wire

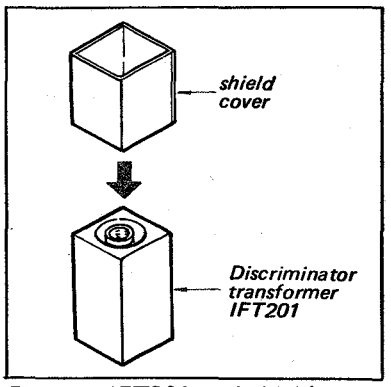


Fig. B IFT201 and shield cover

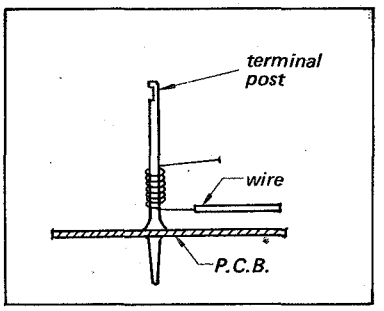


Fig. C "Wire-wrap" connection

SECTION 1
TECHNICAL DESCRIPTION

1-1. TECHNICAL SPECIFICATIONS

Technical specifications for the HP-210 are listed in Table 1-1.

TABLE 1-1. HP-210 TECHNICAL SPECIFICATIONS

Fm Tuner Section

Antenna:	300 ohms balanced
Frequency range:	87.5 to 108 MHz
Intermediate frequency:	10.7 MHz
Usable sensitivity:	2.5 μV (S/N = 30 dB) 1.6 μV (S/N = 20 dB)
Signal-to-noise ratio:	65 dB, IHF
Capture ratio:	1.5 dB, IHF
Selectivity:	50 dB, IHF
Image rejection:	45 dB
I-f rejection	80 dB
Spurious signal rejection:	49 dB
A-m suppression:	50 dB
Frequency response:	50 to 15,000 Hz ±2 dB
Harmonic distortion:	Mono: 0.5% at 400 Hz Stereo: 0.8% at 400 Hz
Fm-stereo separation:	Greater than 36 dB at 400 Hz
19-kHz, 38-kHz suppression:	45 dB

A-m Tuner Section

Frequency range:	530 to 1,605 kHz
Intermediate frequency:	455 kHz
Sensitivity:	50 dB/m, built-in antenna 10 μV, external antenna
Signal-to-noise ratio:	50 dB
Image rejection:	40 dB at 600 kHz 35 dB at 1,400 kHz
I-f rejection:	40 dB at 1,000 kHz
Harmonic distortion:	0.8%

Audio Amplifier Section

Dynamic power: (IHF constant power supply method)	28 watts, both channels operating, 8 ohms, 1% THD
Music power output: (EIA)	36 watts total
Continuous RMS power:	10 watts, per channel, both channels operating, 8 ohms
Harmonic distortion:	Less than 1.0% at 1 kHz at rated output
Frequency response:	TAPE: / AUX: } 30 to 50 kHz (±3 dB) at 1-watt output
Input sensitivity and impedance:	PHONO: 600 mV, 1 M ohms TAPE: 400 mV, 100 k ohms AUX: 250 mV, 100 k ohms REC/PB: 400 mV, 100 k ohms
Signal output:	REC OUT: 250 mV, 10 k ohms ※ REC/PB: 30 mV, 80 k ohms
Signal-to-noise ratio (IHF (B) network):	PHONO: greater than 58 dB TAPE: / AUX: greater than 66 dB
Tone controls:	BASS: ±10 dB at 100 Hz TREBLE: ±10 dB at 10 kHz
Loudness:	8 dB up at 50 Hz 4 dB up at 10 kHz (VOLUME-control attenuation: 30 dB)

※ : General Export Model only

Phonograph Section

Record changer:	BSR C-116, four speeds (16⅔, 33⅓, 45, 78 rpm)
Cartridge:	SONY Crystal Cartridge VX-18P
Stylus:	SONY Diamond Stylus ND-120P
Number of records played automatically:	Up to 5 LP records

Speaker Section (SS-210)

System:	2-way (6½" (16 cm) woofer, 2" (5 cm) tweeter)
Impedance:	8 ohms
Dimensions:	9¼" (width) x 15" (height) x 8⅜" (depth) 235 mm (width) x 380 mm (height) x 213 mm (depth)
Net weight:	6 lb 10 oz (3.0 kg)
Shipping weight:	18 lb 12 oz (8.5 kg) per pair in shipping carton

General

Power consumption:	50 watts ※ 75 watts
Power requirements:	120V ac ※ 100, 120, 220, 240V 50/60 Hz ac
Dimensions:	16⁹/₁₆" (width) x 9½" (height) x 16⅛" (depth) 421 mm (width) x 241 mm (height) x 410 mm (depth)
Net weight:	24 lb 8 oz (11.1 kg)
Shipping weight:	30 lb 14 oz (14 kg)

※ : General Export Model only

1-2. CIRCUIT ANALYSIS

The following describes the functions of all stages and controls. The text sequence follows signal paths. Stages are listed by transistor reference designation at the left margin; major components are also listed in a similar manner. Refer to the block diagram on page 7 and the schematic diagrams on pages *40* to *43*.

Stage/Control	*Function*
Fm Front-End	
Balun B101	This transformer matches 300-ohm twin lead to the fm front-end's input stage.
Rf amplifier Q101	The rf amplifier and tuned circuits provide high sensitivity, good image rejection, and good selectivity. Field-effect transistor Q101 is ideally suited for this job since it has low-noise characteristics and a wide dynamic range. The latter characteristic results in very low-cross modulation products. Antenna coil L101 is tapped to match the low-input impedance of the common gate amplifier.
Local oscillator Q103	This oscillator supplies injection voltage to the mixer via oscillator coil L103. The circuit is a modified Hartley oscillator with feedback applied to the emitter from a tap on tank coil L103.
AFC circuit D101, D102 C115, C119, R113, R114, R115	An automatic frequency control circuit is incorporated in the oscillator to provide easy reception of fm signals. Tuning is usually performed by ear, that is, turning the tuning knob and setting it to the position where the clearest sound is heard. However this is rather difficult job. By using afc, the difficulty of tuning and frequency drift in the local oscillator can be eliminated. The principle of afc operation is as follows: When the tuner is correctly tuned, the intermediate frequency is kept 10.7 MHz and no dc correction voltage is produced by the ratio detector as shown in the "S" curve response Fig. 1-1. So, the voltage applied to diode D101 is determined solely by the positive fixed reverse bias voltage supplied by zener diode D102. Now assume that the local oscil-

Stage/Control	*Function*
	lator frequency changes by $+\Delta f$. This means that the new intermediate frequency is 10.7 MHz $+\Delta f$. See Fig. 1-1. As the result a positive dc component is fed back to the anode of D101, decreasing the reverse voltage to it, and making D101's barrier capacitance increase. This decreases the local oscillator's frequency since the series circuit composed of C119 and D101 is connected in parallel with the tank circuit of the local oscillator. Conversely, if the local oscillator frequency decreases, a negative dc voltage is fed back to D101, increasing the local oscillator frequency.
Mixer Q102	Rf signals and local-oscillator voltage are heterodyned in the base-emitter junction of mixer Q102 to produce 10.7-MHz i-f output signal. Transformer IFT-101 and capacitors C105 and C106 form a high "C", pi-network bandpass filter, which passes the i-f output and provides a path to ground through C105 and C106 for the other heterodyne products and oscillator harmonics.
Fm I-f Amplifier	
I-f amplifiers Q201 to Q204	The i-f amplifier stages consist of two pairs of direct-coupled amplifiers that provide essentially flat response. The selectivity of this section is determined by two-pairs of filters (CF201, CF202, CF203, and CF204) in the inter-stage-coupling path. Each of these filters is a two-section ceramic filter that operates in the "trapped-energy" mode. The filters provide extremely sharp skirt selectivity and flat response inside the pass band. These filters determine overall selectivity in the fm tuner.
I-f output Q205	Q205 provides power to drive the ratio detector.

Stage/Control	*Function*
Ratio detector IFT201, D201, D202	IFT201 and diodes D201 and D202 form a balanced ratio detector that transformes the frequency-modulated signal into an audio signal. Output appears across C207.
MPX Decoder	
SCA trap coil L301, C306	The composite signal containing monaural information from 0 to 15 kHz, the 19 kHz pilot carrier and the stereo signal at 38 kHz ±15 kHz is fed to the MPX decoder through a trap consisting of L301 and C306. This trap removes the unwanted SCA signals (67 kHz) to feed a clean composite signal to the base of Q303.
19-kHz amplifier Q303	This stage serves two functions. It extracts the 19-kHz pilot signal by means of a tuned circuit at its collector, and provides a low-impedance source of composite stereo signal (without the pilot carrier) at its emitter. Series-resonant circuit in the emitter circuit eliminates the 19-kHz pilot signal from the composite stereo signal.

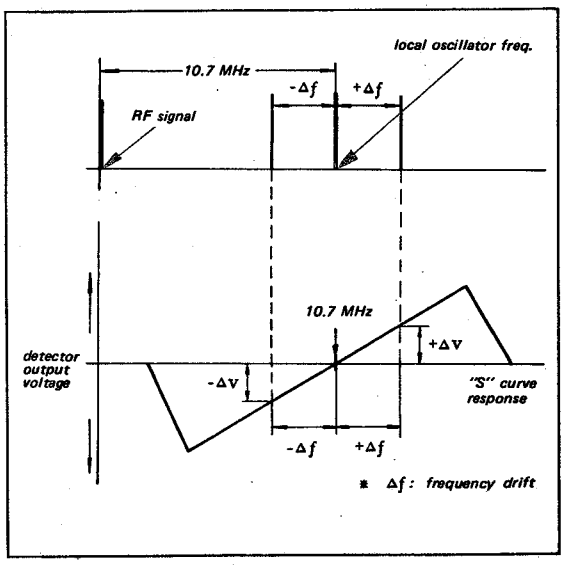


Fig. 1-1 Local oscillator frequency drift and afc voltage relation

Stage/Control	*Function*
Frequency doubler D301, D302	Signals developed at the collector of Q303 are transformer-coupled to a full-wave rectifier consisting of D301 and D302. The output of this rectifier is not filtered, resulting in two positive pulses for each input cycle. Thus the 19-kHz pilot-carrier frequency is effectively doubled by D301 and D302. However, the waveform is not sinusoidal at the base of Q305.
38-kHz amplifier Q305	The 38-kHz pulses produced by D301 and D302 are amplified by Q305. The tank circuit at the collector of Q305 is tuned to 38 kHz to restore these pulses to a sinusoidal waveform for use as a switching signal. This signal is transformer-coupled to the bridge-type demodulator to supply sampling drive for the demodulator.
STEREO-lamp circuit Q304, Q305	The STEREO indicator lights when an fm-stereo signal is received. The emitter of Q305 is connected to the base of Q304, which is normally cut off. The circuit operates as follows: When a composite stereo signal is applied to the multiplex decoder, the 38-kHz pulses produced at the output of the frequency doubler yield a higher-average current flow through Q305. This forces Q304 into conduction, lighting STEREO indicator lamp PL1.
Multiplex demodulator D303, D304 D305, D306	The demodulator circuit employs four diodes in a balanced bridge arrangement. This system has the advantage of cancelling residual rf components (38-kHz signal, some 19-kHz signal, and higher-order harmonics of these frequencies). "L" and "R" components are developed at each side of the bridge as the result of demodulation, when the receiver is operated in the stereo mode. In the monaural mode, diodes D303 and D304 are forward biased by supply voltage through the STEREO lamp, R321, R326 and R327, so these diodes merely act as small resistances. Under this condition, the monaural signal is applied to both "L" and "R" audio amplifiers.
De-emphasis circuit C319, C320	These capacitors provide the roll-off at high audio frequencies necessary to compensate for pre-emphasis at the transmitter.
Twin-T filter C321, C325, R335, R332, R336, C324 (C322, C326 R334, R333, R337, C323)	This filter eliminates the 38-kHz carrier, thereby preventing carrier leak.
A-m Tuner	
Local oscillator Q404	This stage supplies injection voltage to the mixer via L402. The circuit is a modified Hartley oscillator with feedback applied to the emitter of Q404 from the tap on the secondary winding of oscillator coil L402.
Mixer Q401	Incoming rf signals and local-oscillator voltage are heterodyned in the base-emitter junction of Q401 to produce the 455-kHz output. IFT401 is a transformer tuned for 455 kHz. It develops the i-f signal, and provides a path to ground through bypass capacitor C405 for the other heterodyne products. The low-impedance output winding of IFT401 provides link coupling to i-f amplifier Q402.
I-f amplifier Q402	This stage is basically an RC-coupled amplifier. The selectivity of the stage is determined by a double ceramic filter (CF401) in the interstage-coupling path. This filter provides extremely sharp skirt selectivity inside the pass band.
Ceramic filter CF401	

Stage/Control	*Function*
I-f amplifier Q403	This circuit provides the power to drive envelope detector D401.
Agc circuit D402, R415, C426, R428, C425, R412, R427, C422, C421, R401	The positive dc component at the cathode of diode D402 is fed back to the base of Q403, and from there to Q401 to control its gain. The time constants of the agc components filter audio variations out of the agc voltage.

Audio Amplifier

Since the audio-amplifier section contains two identical amplifier chains, only the left channel will be described.

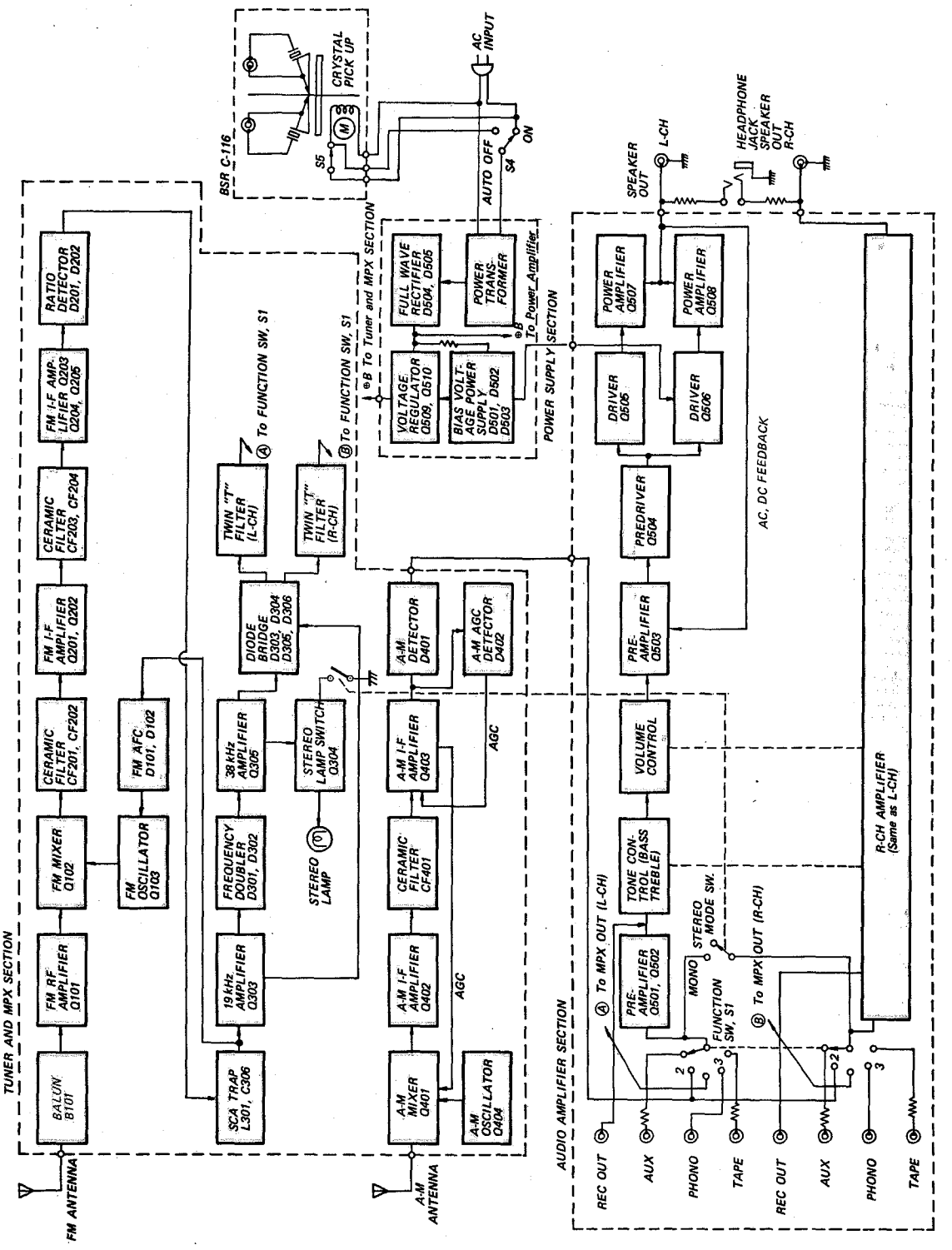
MODE switch S2	In the STEREO position of S2, left and right input signals are routed to their respective amplifiers. In the MONO position, the left and right signals are added. The sum is then fed to both amplifier channels.
Preamplifier Q501, Q502	This stage amplifies the small signal provided by the phono cartridge, tape recorder, to the level required at the input of the power-amplifier section. The preamplifier uses a complicated negative-feedback technique that provides stable operation during temperature changes, and good amplification at low-frequencies. It also applies the audio signal to the REC OUT jack for optimum recording.
Equalization circuit R505, C502, R506, C501, R503	Phono equalization is achieved by these filter circuits to obtain a flat response.
Feedback circuit R519, C510	In the any position of the FUNCTION switch, feedback is applied through R519 and C510 to provide a flat response in the preamplifier. Be sure to use replacement components with the exact same values.
Attenuator R501, R502, R507, R508	Signal applied to the TAPE or AUX input jack is attenuated by these resistors. This allows the HP-210 to accept signals of about 400 mV at the TAPE and 250 mV at AUX input jack, and amplify them without distortion.
Channel separation adj. R524	This network connects the emitters of preamplifiers Q501 and Q601 only when the FUNCTION switch is set to the FM position. It provides a form of negative feedback between the left and right channels. Any residual inverted "L" signals in the "R" channel are cancelled out by the "L" signal from the "L" channel. The same is true of residual "R" signals in the "L" channel.
BASS control RV531	This control has a range of ±10 dB at 100 Hz.
TREBLE control RV532	This control has a range of ±10 dB at 10 kHz.
Loudness circuit R536, R537, C535, C536	This compensates for the characteristics of the human ear, whose tonal response varies according to the loudness of the sound being heard. High- and low-frequency components are increased in inverse proportion to the VOLUME control setting by means of R536, R537, C535 and C536.
VOLUME CONTROL RV701	The level of signal applied to the power amplifier is determined by the setting of RV701.
Predriver Q503	Q503 amplifies the signal to the level required at the power output stages.
Ac balance adj. RV541	Controls the bias current of Q503 and Q504 to the point where positive and negative half cycles are simultaneously clipped when increasing the input signal. It also affects the rated output power.
Phase inverter Q504	Stage Q504 has two oppositely-phased outputs to drive the power-output stages in push pull.

Stage/Control	*Function*
Positive bias power supply D501, D502, D503	These diodes are forward biased by supply voltage through R564 and provides stabilized dc voltage of about 1.8V, supplying idling current for Q506, Q606.
Dc bias adj. RV542	Controls the idling current in Q505, Q506, Q507 and Q508 to eliminate crossover distortion at small signal levels.
Negative-feedback loop R557, R556 C547	These components provide negative-feedback voltage from the output of the power amplifier to the emitter of Q503.
Drivers Q505, Q506	These transistors operate as emitter followers to provide the current swings demanded of the output stages for full output.
Power amplifier Q507, Q508	These SONY silicon transistors have been specially manufactured to drive the speaker system. Output is coupled to the speakers through C548.

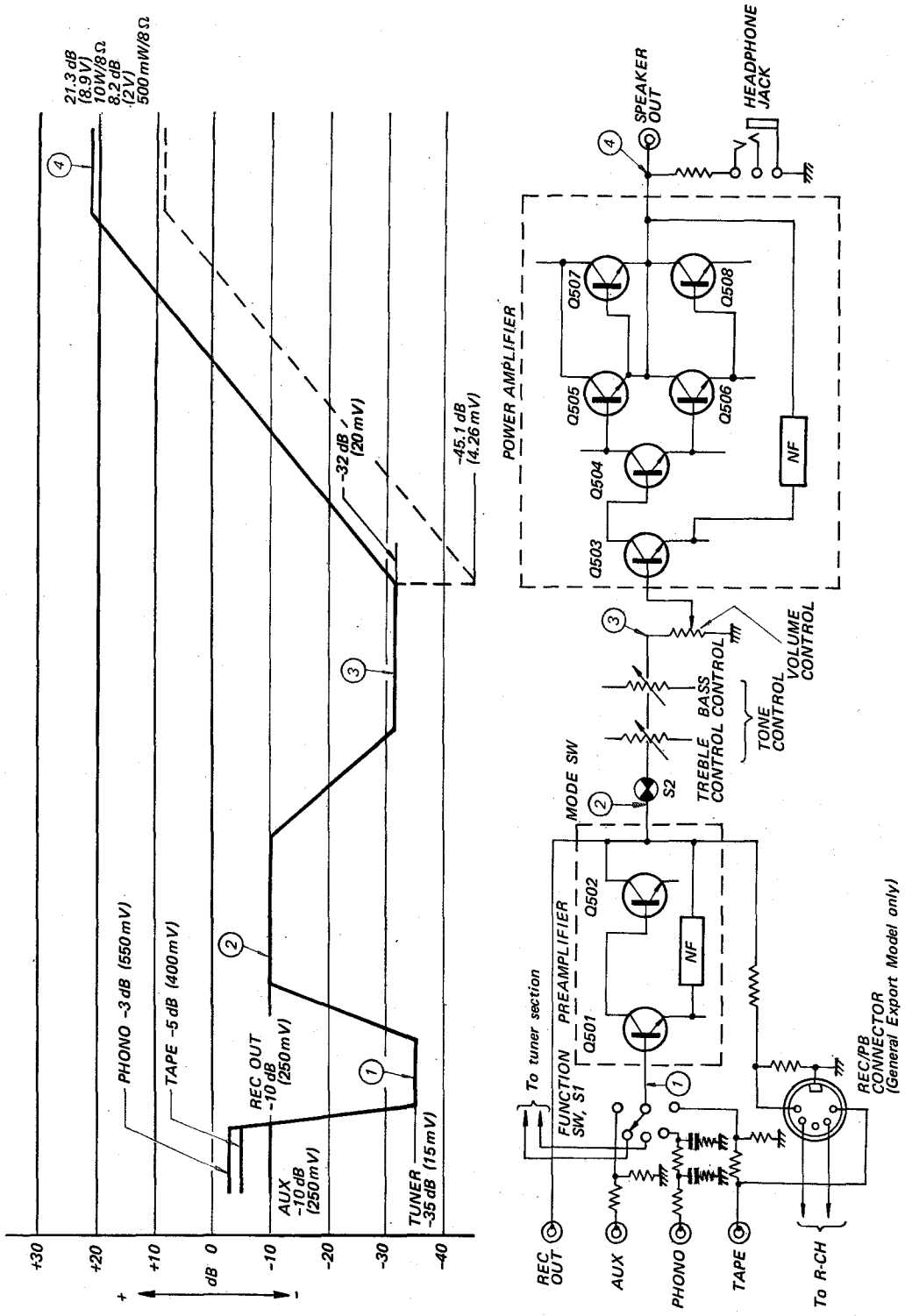
Stage/Control	*Function*
Power Supply	
Voltage regulator Q509, Q510	DC output from rectifier D504, D505 is filtered by C701 and applied to series regulator Q510. Q509 compares a sample of the output voltage picked off across R568. A change in output voltage is detected at the base of Q509 and therefore alters its collector voltage. Since the collector of Q509 is directly coupled to the base of Q510, the change in output voltage alters the conduction of Q510 by the amount necessary to maintain the output voltage constant. An increase in output voltage causes an increase in the impedance (decrease in conduction) of Q510, and vice-versa. The dc output voltage supplied to the tuner is thus stable.

1-3. BLOCK DIAGRAM

– Audio Amplifier/Tuner and MPX Section –



1-4. LEVEL DIAGRAM



Note: Signal voltage are measured with VTVM and expressed in dB referred to 0.775 V, 1 kHz.

2-5. FRONT PANEL REMOVAL

1. Remove the top cover as described in Procedure 2-3.
2. Remove the all control knobs by pulling them off.
3. Remove the HEADPHONE jack by using jack driver or pliers.
4. Refer to cross sectional view Fig. 2-4, lift the bottom part of the front panel up while pulling it forward as shown in Fig. 2-5. This frees the lower catch.
5. Press the top of the front panel as shown in Fig. 2-6. This frees the front panel.
6. To reassemble the front panel, reverse the foregoing procedures.

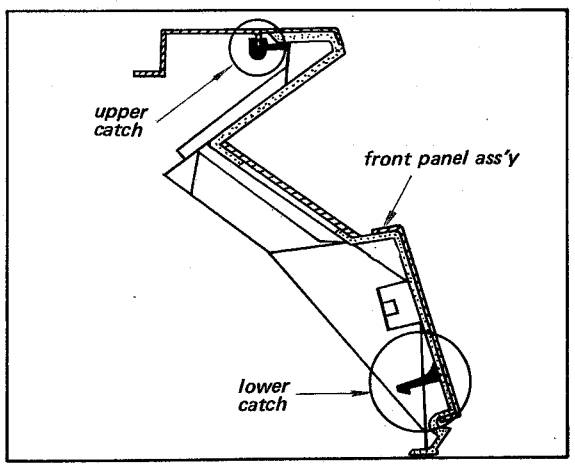


Fig. 2-4. Cross sectional view of front panel

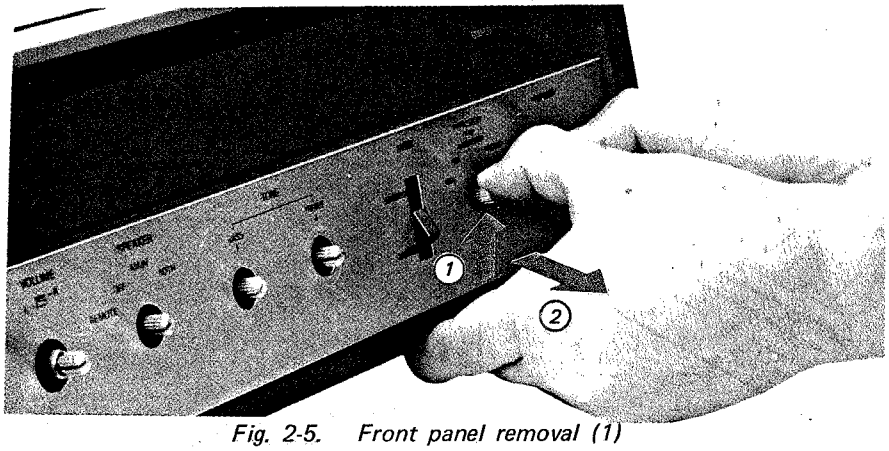


Fig. 2-5. Front panel removal (1)

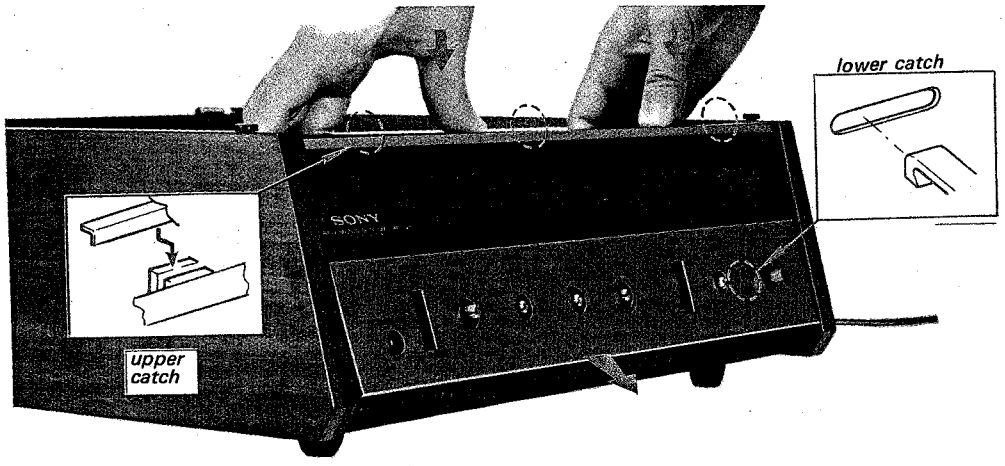


Fig. 2-6. Front panel removal (2)

2-6. WOODEN CASE REMOVAL

1. Remove the record changer as described in Procedure 2-4.
2. Remove the two self-tapping screws (⊕ B 3x6) securing the motor board bracket to the front subchassis as shown in Fig. 2-8.
3. Remove the six self-tapping screws (⊕ B 3x6) from the bottom and one self-tapping screw (⊕ B 3x16) from the rear of the wooden case as shown in Fig. 2-7.
4. Carefully lift the wooden case straight up.

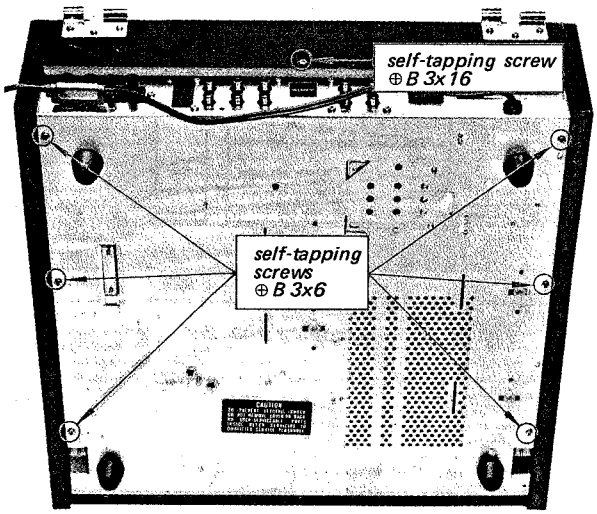


Fig. 2-7. Bottom view

2-7. DIAL-CORD RESTRINGING

Preparation

1. Remove the front panel and wooden case as described in Procedures 2-5 and 2-6.
2. Cut a 71-inch (1800 mm) length of 1/64-inch (0.5 mm) diameter dial cord.
3. Tie the end of the cord to a spring as shown in Fig. 2-9.
4. Rotate the tuning-capacitor drive drum fully counterclockwise (minimum capacitance position).

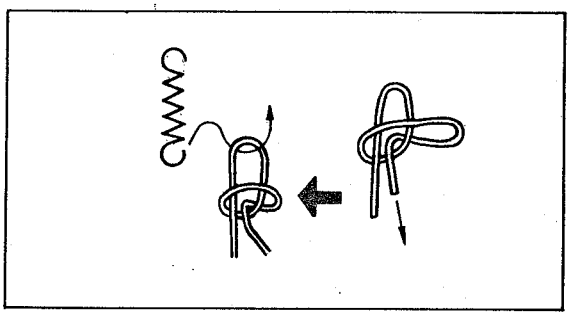


Fig. 2-9. Tying square knot in the coil spring

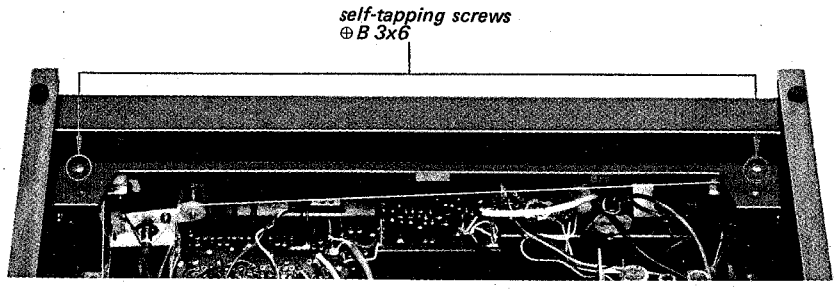


Fig. 2-8. Wooden case removal

Procedure

While referring to Fig. 2-10, proceed as follows:

1. Hook the spring to one hole of the drive drum as shown in Fig. 2-11, and then squeeze it.
2. Run the cord through the slot in the rim of the drum and wrap a counterclockwise turn in the inner side groove. See Fig. 2-12.
3. Run the cord over pulley "A", and then wrap three counterclockwise turns around the tuning shaft.
4. Run the cord over pulleys "B", "C" and "D" then wrap three counterclockwise turns around the drum from outer groove to inner groove as shown in Fig. 2-12.
5. Pass the doubled end of the cord through the eyelet (See Fig. 2-13), then hook it to the spring as shown in Fig. 2-14.
6. Tighten the cord, then squeeze the eyelet so that the spring is under tension.
   Make a knot in the cord end to keep it from slipping out of the eyelet. See Fig. 2-13.
7. After completing the dial-cord stringing, make sure that the tuning system works properly. Apply a drop of contact cement to the knots. Perform the mechanical dial calibration.

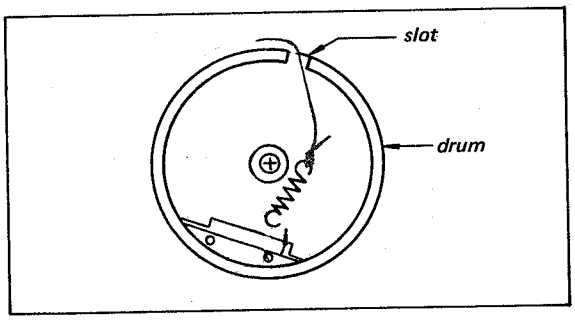


Fig. 2-11. Coil spring installation

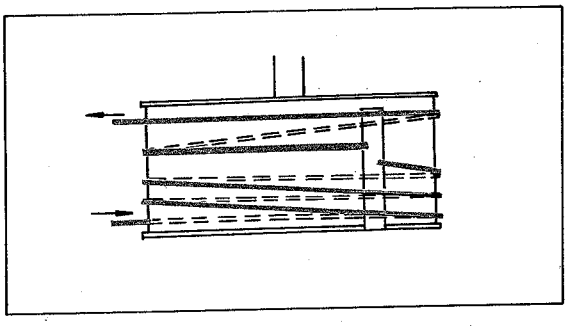


Fig. 2-12. Wrapping the dial cord

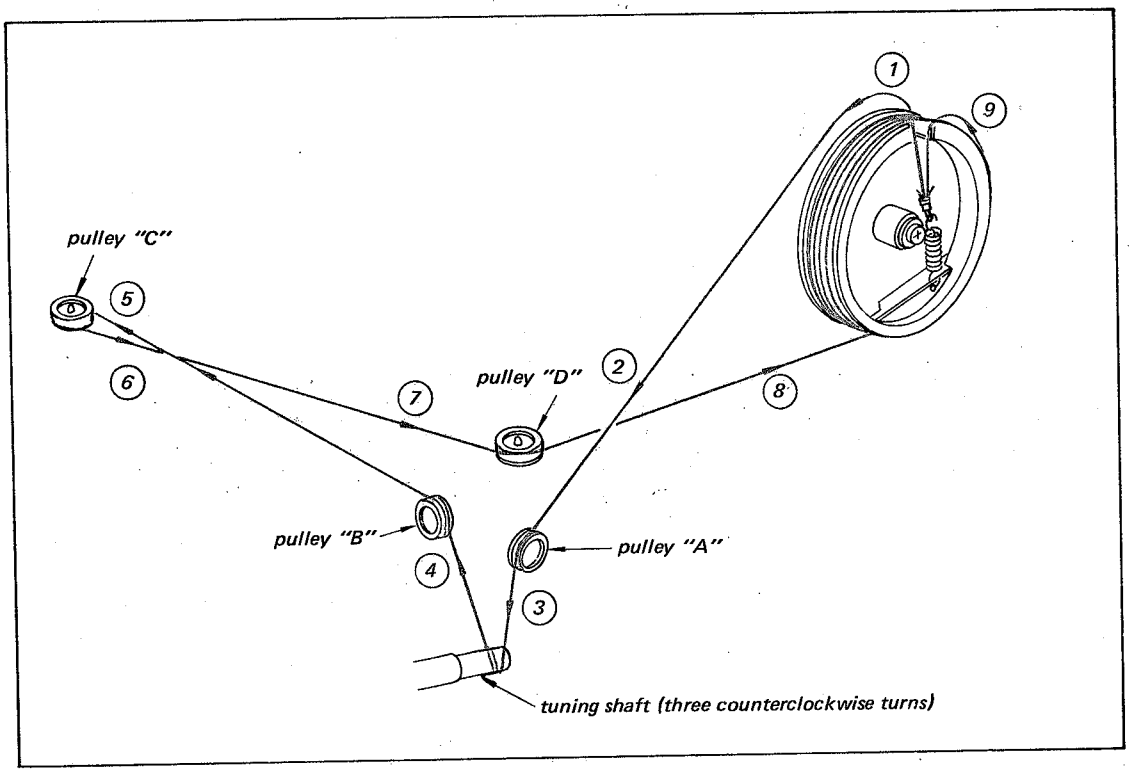


Fig. 2-10. Dial cord stringing

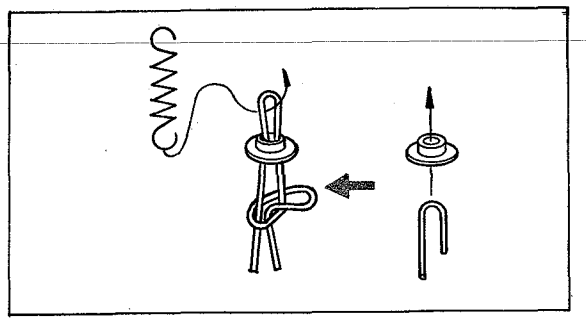


Fig. 2-13. Detail of dial cord finish

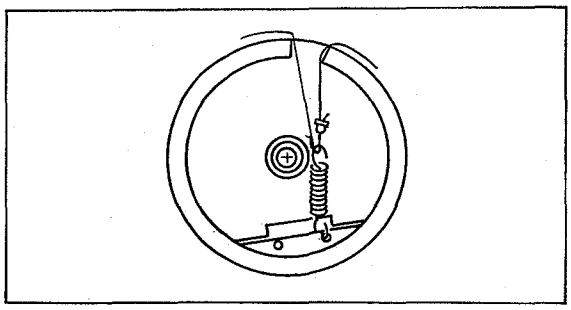


Fig. 2-14. End of dial cord stringing

2-8. MECHANICAL DIAL CALIBRATION

Note: This is required after replacing the dial cord.

1. Put the dial pointer on the cord as shown in Fig. 2-15, and move it to a position where the pointer coincides with the guide hole provided in the front subchassis as shown in Fig. 2-16, when the tuning capacitor is set to the maximum capacitance position.
2. Hook the dial pointer on the dial pointer restricting cord as shown in Fig. 2-16.

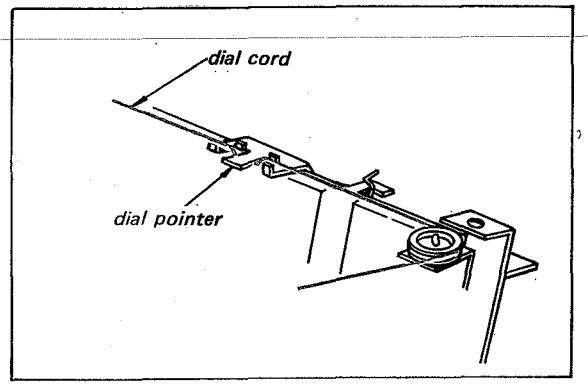


Fig. 2-15. Dial pointer installation

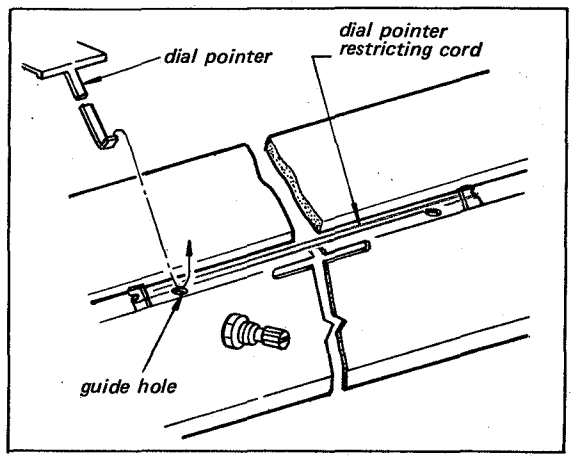


Fig. 2-16. Mechanical dial calibration

2-9. PILOT LAMP REPLACEMENT

Prepare for replacing any of the pilot lamps by removing the record changer as described in Procedure 2-4.

Stereo Lamp

1. Pull the lamp from its rubber holder.
2. Unsolder the defective lamp leads from the connecting terminals on the tuner board, and then install the new lamp.

Dial Lamp

1. Remove the front panel as described in Procedure 2-5.
2. Pry out the defective lamp, and then install the new one.

2-10. CONTROL AND SWITCH REPLACEMENT

Prepare for replacing any of the controls or switches by removing the front panel as described in Procedure 2-5.

TONE Controls

1. Remove the hex nuts that secure the BASS and TREBLE controls to the front subchassis as shown in Fig. 2-17.
2. Cut the two lead wires connecting between the tone control board and preamplifier board.
3. Carefully remove them along with the tone control circuit board.
4. Cut each lug of the defective control on the board to remove the part.
5. Unsolder and remove the clipped lugs, and clean out the holes in the circuit board.
6. Install the replacement control.

FUNCTION Switch (slide/rotary switch)

1. Remove the hex nut securing it to the front subchassis as shown in Fig. 2-17.
2. Cut the two lead wires connecting between preamplifier board and tone control board as shown in Fig. 2-18.
3. Remove the lead wires from the clamp/PCB support one by one and then unhook the fiber support as shown in Fig. 2-18. This frees the preamplifier board.
4. With a soldering iron having a solder-sucking tip, clean the solder from each lug of the defective switch and the printed board.
5. Install the replacement switch.

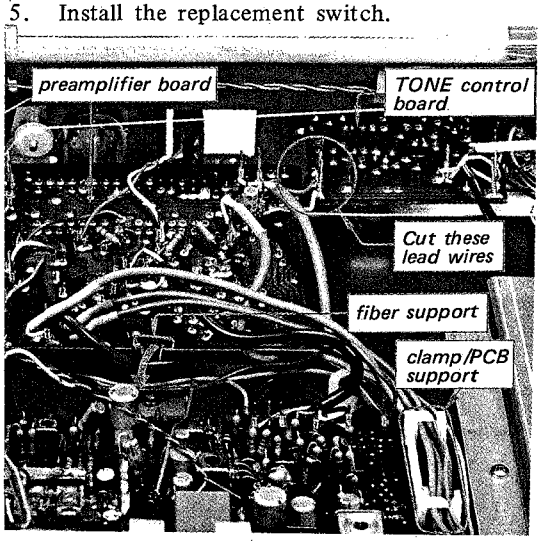


Fig. 2-18. Preamplifier board removal

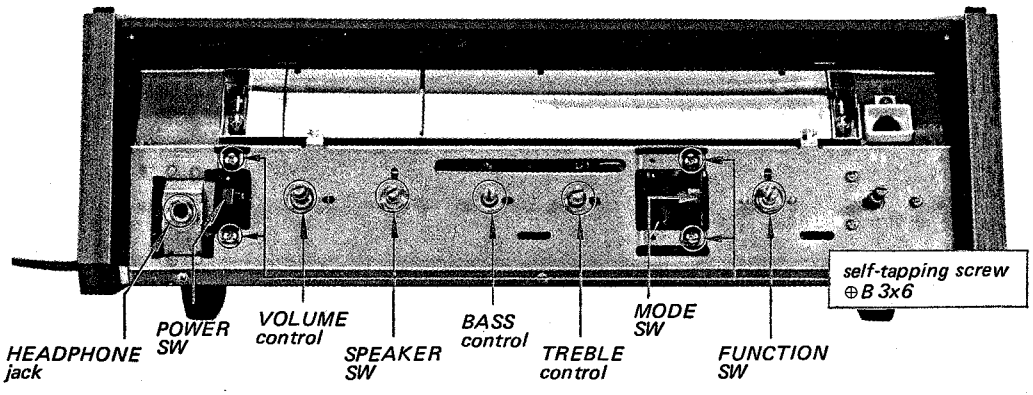


Fig. 2-17. Control and switch replacement

VOLUME Control, SPEAKER Switch and HEADPHONE Jack

1. Remove the hex nuts that secure them to the front subchassis as shown in Fig. 2-17.
2. Unsolder the lead wires from the defective parts, and then install the replacement parts.

MODE and POWER Switches

1. Remove the two screws securing the switch to the front subchassis as shown in Fig. 2-17.
2. Unsolder the lead wires from the defective switch, and then install the replacement switch.

2-11. PCB REMOVAL

Prepare for removing any of the printed circuit boards by removing wooden case as described in Procedure 2-6.

Tone Control and Preamplifier Boards

1. Refer to the tone control replacement procedures for tone-control board removal as described in Procedure 2-10.
2. Refer to the function switch replacement procedures for preamplifier board removal as described in Procedure 2-10. See Fig. 2-18.

Tuner and MPX Board

1. Fasten the dial cord to the drum, pulley "A" and pulley "D" with cellophane tape. This helps you to restring the dial cord.
2. Unsolder the fm and a-m antennal lead wires from the antenna terminals.
3. Remove the three self-tapping screws (⊕ B 3x6) securing the tuning capacitor and PCB brackets to the chassis as shown in Fig. 2-19. This frees the tuner and MPX board.

Power Amplifier Board

1. Remove the two lead wires (green and black) from the power amplifier PCB support and the two lead wires (red and orange) from the tuner and MPX PCB support, and then remove the two self-tapping screws securing the heat sink to the chassis as shown in Fig. 2-19. This frees the power amp PCB.
2. Insert the tabs of the PCB into the opening in the chassis as shown in Fig. 2-20. This helps in replacing or checking the components mounted on PCB.

2-12. AC OUTLET REPLACEMENT

1. Remove the wooden case as described in Procedure 2-6.
2. Pry out the socket retaining clip with a screwdriver as shown in Fig. 2-21. This frees the ac outlet.
3. Install the replacement ac outlet.

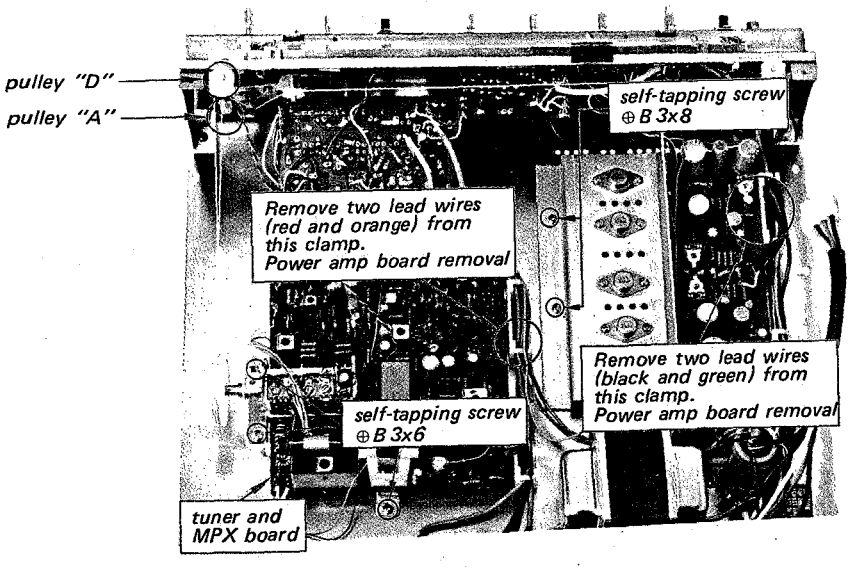

pulley "D"
pulley "A"
self-tapping screw ⊕B 3x8
Remove two lead wires (red and orange) from this clamp. Power amp board removal
Remove two lead wires (black and green) from this clamp. Power amp board removal
self-tapping screw ⊕B 3x6
tuner and MPX board

Fig. 2-19. PCB removal

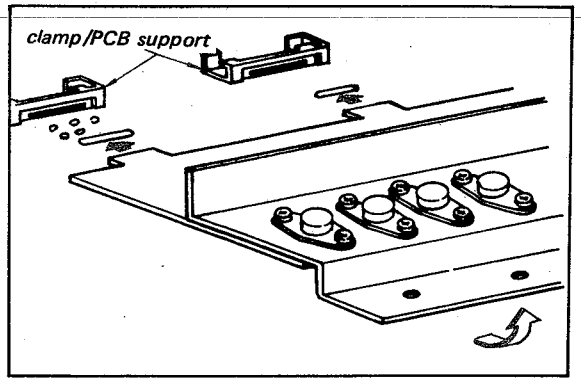


Fig. 2-20. Power amplifier board removal

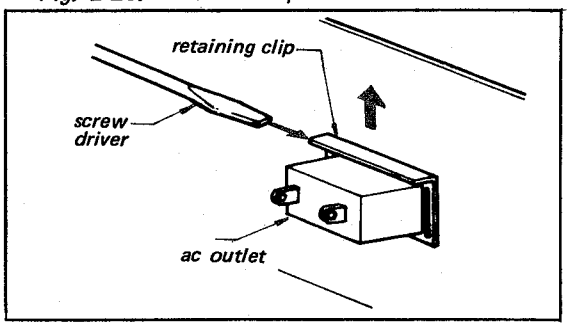
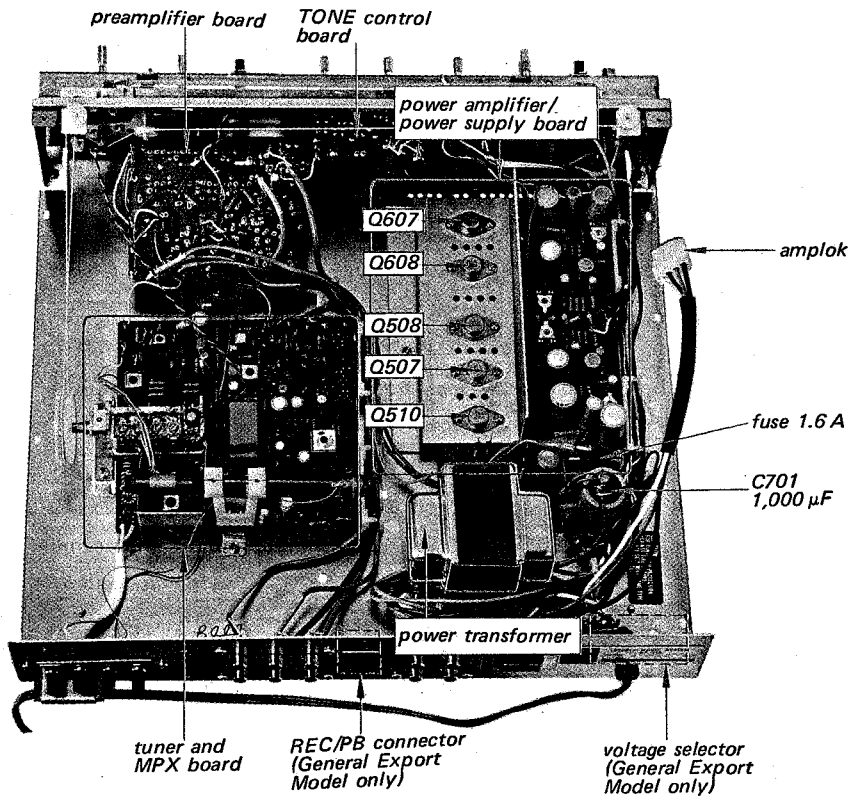


Fig. 2-21. Replacing the ac outlet

2-13. POWER TRANSISTOR REPLACEMENT

1. Remove the power amplifier board as described in Procedure 2-11.
2. Remove the two screws and retaining bracket securing the defective power transistor to the heat sink and PCB.
3. Unsolder the leads of power transistor, and then install the new one.
4. When replacing the power transistor, apply a coating of a heat-transferring grease to both sides of the insulating mica washer. Any excess grease squeezed out when the mounting bolts are tightened should be wiped off with a clean cloth. This prevents it from accumulating conductive dust particles that might eventually cause a short.

2-14. CHASSIS LAYOUT



SECTION 3
ALIGNMENT AND ADJUSTMENT PROCEDURES

3-1. FM I-F AND DISCRIMINATOR ALIGNMENT

CAUTION

The ceramic filters in the fm i-f circuit are selected according to their specified center frequencies and color coded as shown in Fig. 3-1 and listed in Table 3-1. Check the color code of the filters to identify the same center frequency when replacing any of these filters.

TABLE 3-1.

FM I-F CERAMIC FILTERS

Part No.	*Color*	*Specified Center Freq.*
1-403-562-11	red	10.70 MHz
1-403-562-21	black	10.66 MHz
1-403-562-31	white	10.74 MHz
1-403-562-41	green	10.62 MHz
1-403-562-51	yellow	10.78 MHz

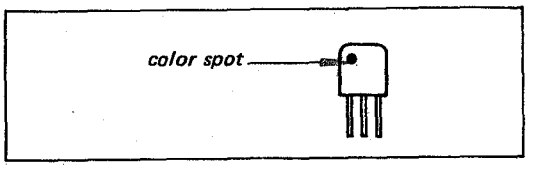


Fig. 3-1. Color dot on ceramic filter

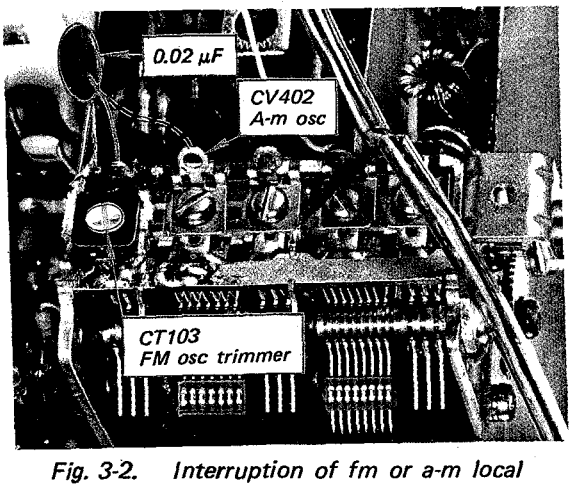


Fig. 3-2. Interruption of fm or a-m local oscillator operation

Note: Two methods of i-f discriminator alignment are available, sweep generator alignment and signal generator alignment. You can use either of them. In either case, the local oscillator should be killed. To stop the local oscillator's operation, remove the shield cover over the local oscillator capacitor, if necessary, and then shunt the oscillator capacitor with a 0.02μF capacitor. See Fig. 3-2.

Sweep Generator Alignment

Test Equipment Required

1. 10.7 MHz sweep generator
2. Oscilloscope
3. Ceramic capacitor, 0.02μF
4. Alignment tools

Preparation

1. Remove the record changer as described in Procedure 2-4.
2. Connect the input cable of the oscilloscope with alligator clips to R221 and ground on the fm a-m tuner circuit board, and solder a 0.02μF capacitor across these clips, as shown in Fig. 3-3.
3. Connect the output cable of the sweep generator across CV102 on tuner and MPX board. Use alligator clips and make the connection through a 0.02μF coupling capacitor as shown in Fig. 3-4.

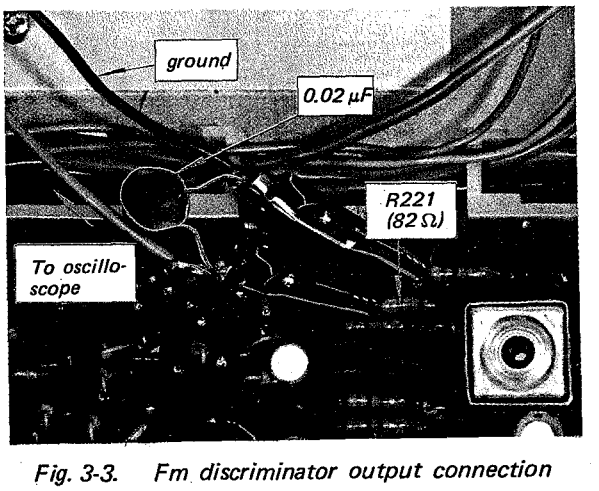


Fig. 3-3. Fm discriminator output connection

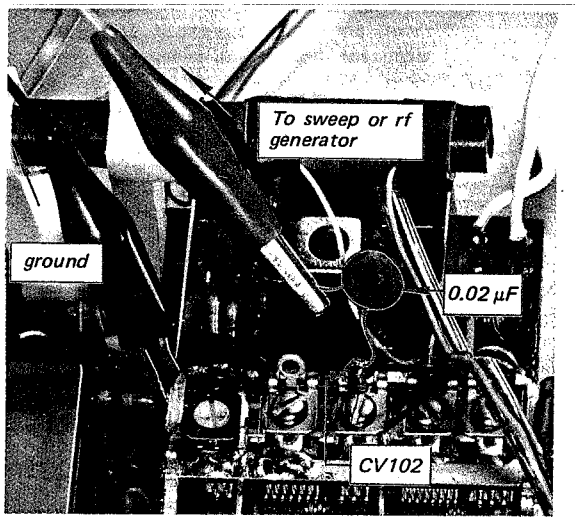


Fig. 3-4. 10.7 MHz signal injection

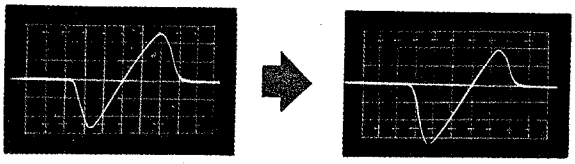


Fig. 3-6. "S" curve response

Procedure

1. With the equipment connected as shown in Fig. 3-5, set the sweep generator's controls as follows:

   Center frequency ..... Specified frequency of ceramic filter. See Table 3-1.
   Sweep width ..... 1 MHz

2. Set the receiver's controls as follows:

   FUNCTION switch .....FM AUTO STEREO
   VOLUME control ..... Minimum

3. Adjust the oscilloscope controls to provide a visible indication.

   Note: Two or three traces will be observed on the oscilloscope as the center frequency of the sweep generator varies. The trace you are looking for has the largest amplitude. Once you get it, decrease the sweep generator output low enough to obtain rather noisy output.

4. Turn the top core (secondary side) of discriminator transformer IFT201 with an alignment tool to obtain the "S" curve response, and equalize the positive and negative peaks of the "S" curve response, as shown in Fig. 3-6.

5. Adjust i-f transformer IFT101 (see Fig. 3-11) and primary side of discriminator transformer (IFT201 bottom core) to obtain a maximum-amplitude "S" curve response.

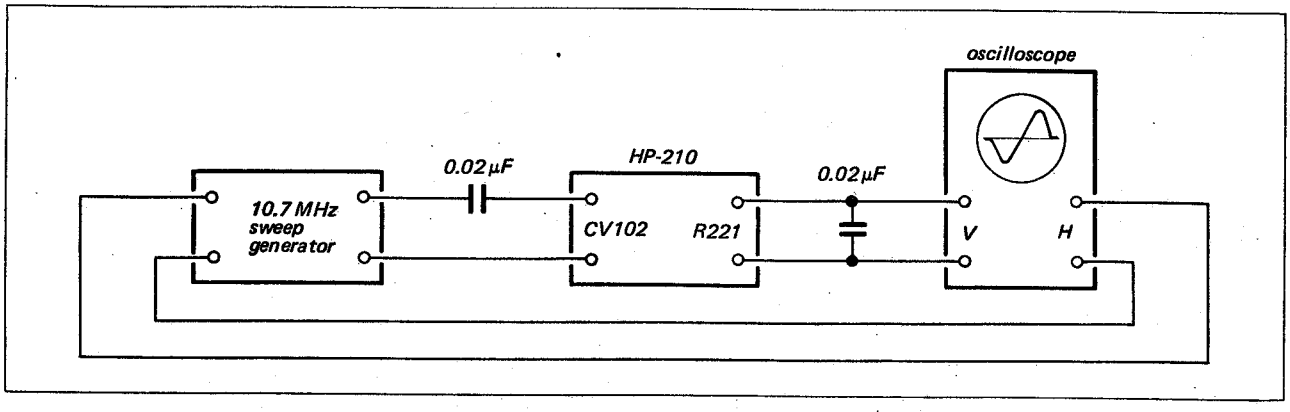


Fig. 3-5. Test setup for discriminator alignment by sweep generator

Signal Generator Alignment

Test Equipment Required

1. Standard signal generator which can generate a 10.7-MHz a-m/fm signal.
2. Oscilloscope
   Vertical sensitivity ..... 100 mV/cm minimum
3. Alignment tools

Preparation

Same as described for the sweep generator method.

Procedure

1. With the equipment connected as shown in Fig. 3-7, set the signal-generator's controls as follows:
   Frequency ..... Specified frequency of ceramic filter. See Table 3-1.
   Modulation ..... Fm, 400 Hz, 100% (75 kHz)
   Output level ..... 10,000μV (80 dB)
2. Set the receiver's controls as follows:
   FUNCTION switch .... FM AUTO STEREO
   VOLUME control ..... Minimum
3. Adjust the signal generator's frequency slightly to obtain a maximum output, and then change the signal generator's modulation to a-m, 400 Hz 30%.
4. If the discriminator transformer is not aligned correctly, 400-Hz ripple will be observed as shown in Fig. 3-8.
5. Turn the top core of transformer IFT201 with an alignment tool to obtain a minimum indication on the oscilloscope as shown in Fig. 3-8.

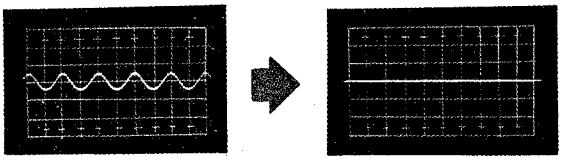


Fig. 3-8. Fm discriminator alignment output response

Note: Turn the core carefully and slowly because the output appearing on the oscilloscope jumps up and down when turning the core. This might cause difficulty in determining the point of minimum output.
Also, at both extreme positions of the top core, decreased output will be observed. The real null point should be obtained in the middle of the core thread length, and maximum output occurs at each side of the true null point.

6. Change the signal generator's modulation to fm, 400 Hz 100% (75 kHz).
7. Turn the core of fm IFT101 (see Fig. 3-11), to obtain the maximum output.

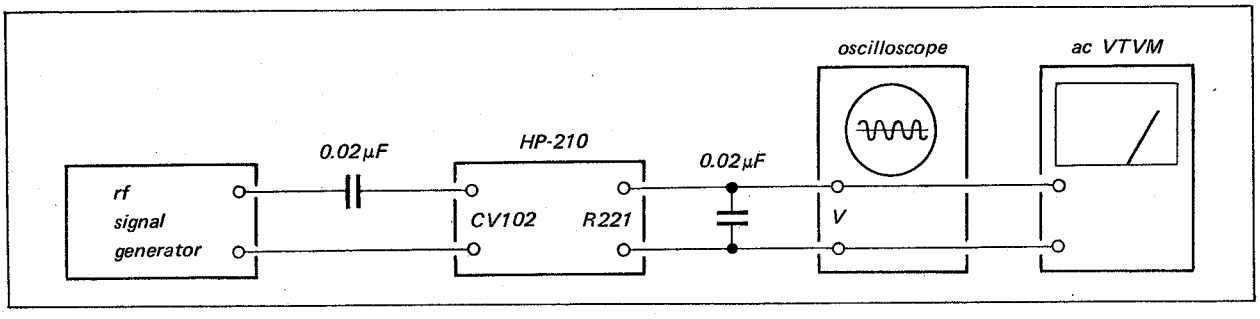


Fig. 3-7. Test setup for fm discriminator alignment by rf signal generator

3-2. FM FREQUENCY COVERAGE ALIGNMENT

Note: Before starting this alignment, the discriminator-transformer alignment should be performed.

Test Equipment Required

1. Standard fm signal generator
2. Ac VTVM
3. Alignment tools

Preparation

1. Remove the record changer as described in Procedure 2-5.
2. Connect the equipment as shown in Fig. 3-10.
3. Set the receiver's controls as follows:

   FUNCTION switch.....FM AUTO
   VOLUME control .....Minimum

4. Short the connection point of R307 and C305 (AFC circuit) to ground as shown in Fig. 3-9.

Generator Alignment

Follow the procedures given in Table 3-2 when performing this alignment with an fm signal generator. Be sure that the dial is mechanically calibrated.

Off-the-Air Alignment

Accurate dial calibration and a frequency-coverage test can also be performed by utilizing off-the-air local fm signals. However, before performing the following procedure, be sure that the dial is mechanically calibrated and AFC circuit is shorted to ground.

Procedure

1. Tune the receiver to the lowest-frequency station.
2. Check the dial scale for a calibration accuracy of ±300 kHz from the carrier frequency of the station. If the dial-accuracy deviation exceeds this limit, turn the local-oscillator coil L103 (shown in Fig. 3-11) slightly until optimum dial calibration is obtained.
3. Tune the receiver to the highest-frequency station in your locality. If the dial-calibration error is excessive, adjust local-oscillator trimmer CT103 to obtain maximum calibration accuracy. See Fig. 3-11.

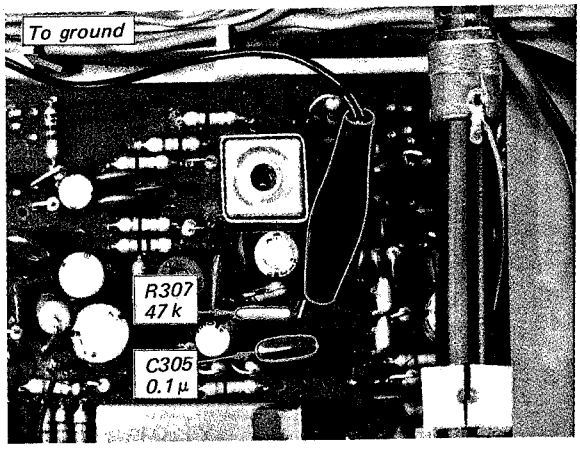


Fig. 3-9. Interruption of AFC circuit

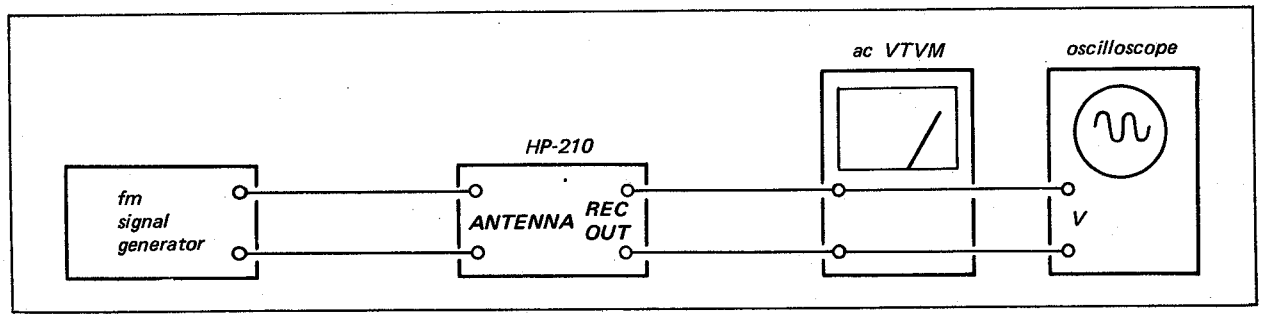


Fig. 3-10. Fm frequency coverage and tracking alignment test setup

TABLE 3-2. FM FREQUENCY COVERAGE ALIGNMENT

Step	Coupling Between Front End and SSG	SSG Frequency and Output Level	Tuner Dial Indication	Scope Connection	Adjust	Indication
1.	Direct coupling	86 MHz 400 Hz 100% mod. 10μV (20 dB)	lowest position	REC OUT	OSC coil L103 See Fig. 3-11	Maximum VTVM reading
2.	Same as above	109.5 MHz 400 Hz 100% mod. 10μV (20 dB)	highest position	Same as above	OSC trimmer CT103 See Fig. 3-11	Same as above

3-3. FM TRACKING ALIGNMENT

Note: Tracking alignment should be performed with a signal generator.

Test Equipment Required

1. Standard fm signal generator
2. Ac VTVM
3. Alignment tools

Preparation

1. Remove the record changer as described in Procedure 2-5.
2. Set the receiver's control as follows:

   FUNCTION switch ..... FM AUTO STEREO
   VOLUME control ..... Minimum

3. Short the connection point of R307 and C305 (AFC circuit) to ground as shown in Fig. 3-9.

Procedure

1. With the equipment connected as shown in Fig. 3-10, follow the procedures given Table 3-3.

TABLE 3-3. FM TRACKING ALIGNMENT

Step	Coupling Between Receiver and SSG	SSG Frequency and Output Level	Tuner Dial Indication	Ac VTVM Connection	Adjust	Indication
1.	Direct coupling	86 MHz 400 Hz 100% mod. 10μV (20 dB)	lowest position	REC OUT	RF coil L102 Antenna coil L101 See Fig. 3-11	Maximum VTVM reading
2.	Same as above	109.5 MHz 400 Hz 100% mod. 10μV (20 dB)	highest position	Same as above	RF trimmer CT102 Antenna trimmer CT101 See Fig. 3-11	Maximum VTVM reading

Adjusting Parts Location

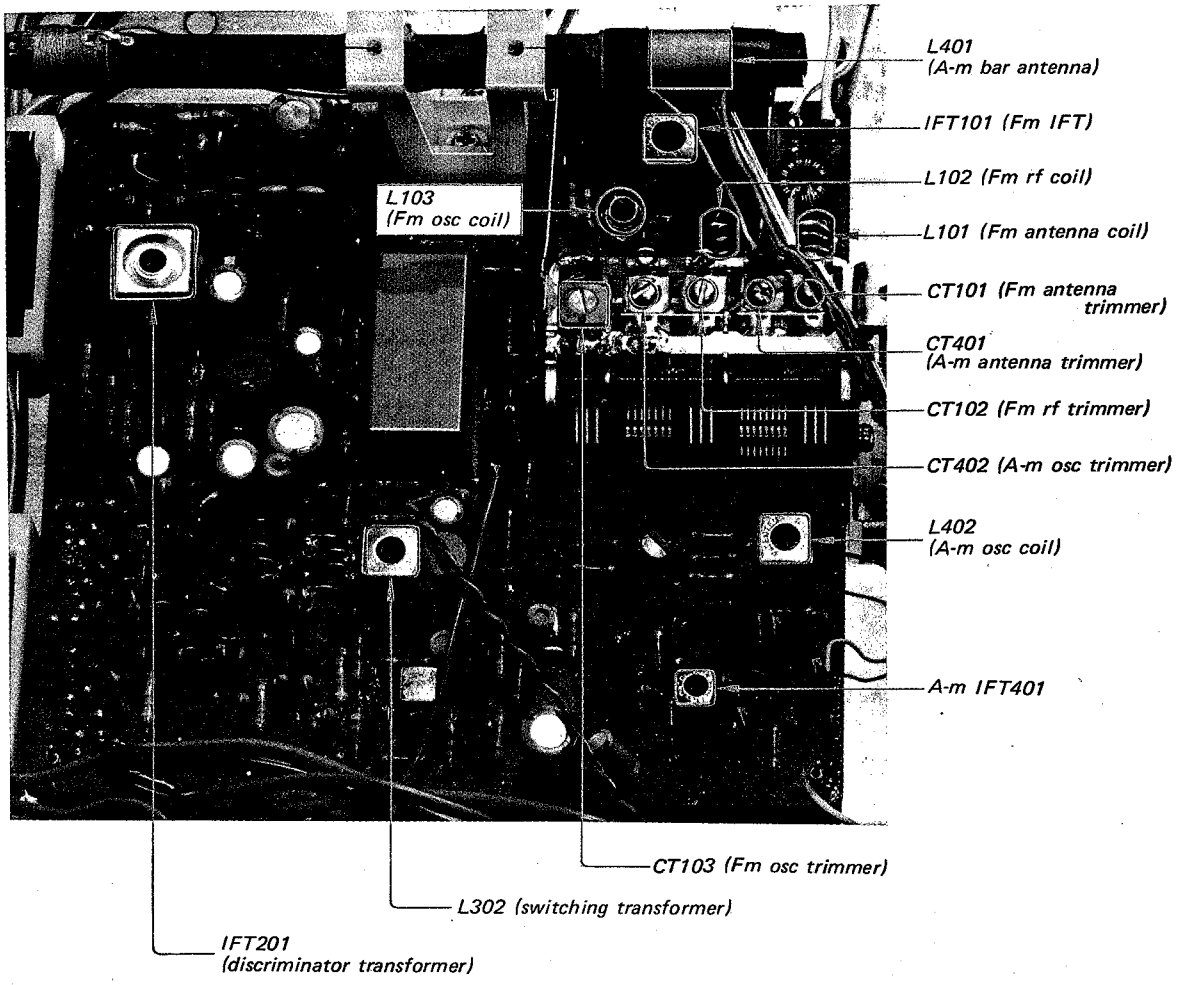


Fig. 3-11. Adjusting Parts Location

3-4. A-M I-F STRIP ALIGNMENT

Preparation

Remove the record changer as described in Procedure 2-4. Then set the receiver's FUNCTION switch to AM.

Note: To perform this alignment, the local oscillator should be killed. To do this, shunt the local oscillator capacitor CT402 with a 0.02μF ceramic capacitor as shown in Fig. 3-2.

Sweep Generator Alignment

Test Equipment Required

1. Sweep generator, 455 kHz.
2. Oscilloscope
3. Alignment tools

Procedure

1. Connect the sweep generator's output directly to the AM EXT ANT terminal.
2. Connect the input cable of the oscilloscope with alligator clips to the connection point of R418 and R419 and ground on the tuner and MPX circuit board as shown in Fig. 3-12.
3. Set the sweep generator's control as follows:

   Center frequency ..... 455 kHz
   Sweep width ..... 25 kHz
   Output ..... as low as possible

4. With the equipment connected as shown in Fig. 3-13, adjust the oscilloscope controls and generator output to provide a visible indication.

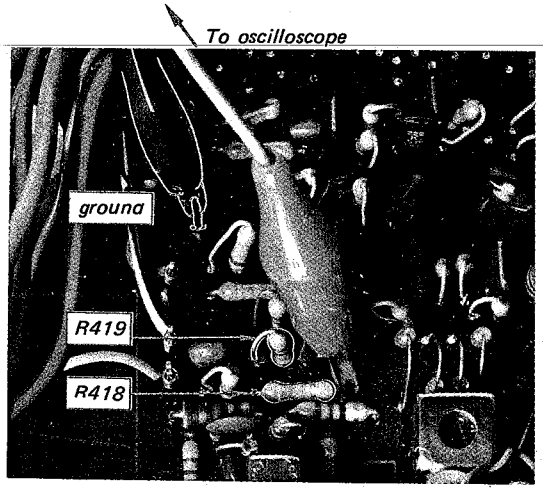


Fig. 3-12. A-m detector output connection

5. Turn the top core of IFT401 (see Fig. 3-11) to obtain a maximum and symmetrical response as shown in Fig. 3-14.

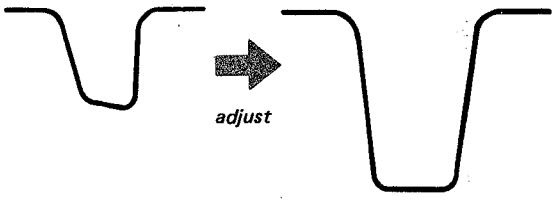


Fig. 3-14. A-m i-f response

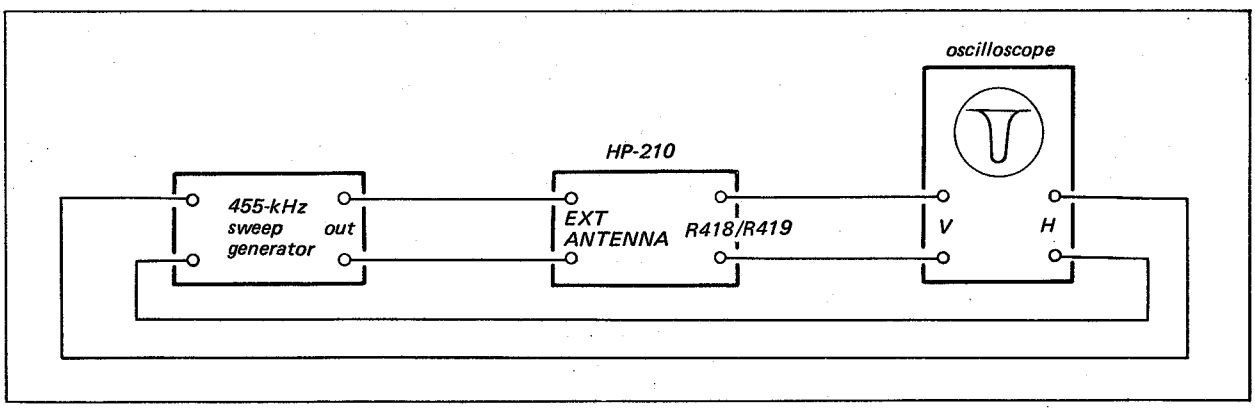


Fig. 3-13. A-m i-f alignment by sweep generator test setup

Rf Signal Generator Method

Test Equipment Required

1. Signal generator, a-m modulation
2. Oscilloscope
3. Alignment tools

Procedure

1. Set the rf signal generator's controls as follows:

   Modulation ..... INTERNAL
   Frequency ..... 455 kHz
   OUTPUT level 1,000μV

2. Connect the rf signal-generator's output to the AM EXT ANT terminal.
3. With the equipment connected as shown in Fig. 3-15, turn the top core of IFT401 (see Fig. 3-11) to obtain the maximum output.

3-5. A-M FREQUENCY COVERAGE AND TRACKING ALIGNMENT

Preparation

Remove the record changer as described in Procedure 2-4. Then, set the receiver's Function switch to AM.

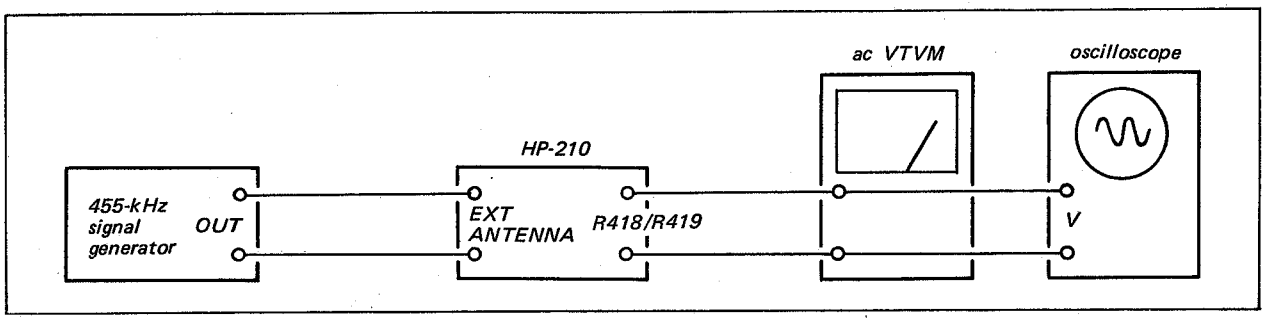


Fig. 3-15. Test setup for a-m i-f alignment by rf signal generator

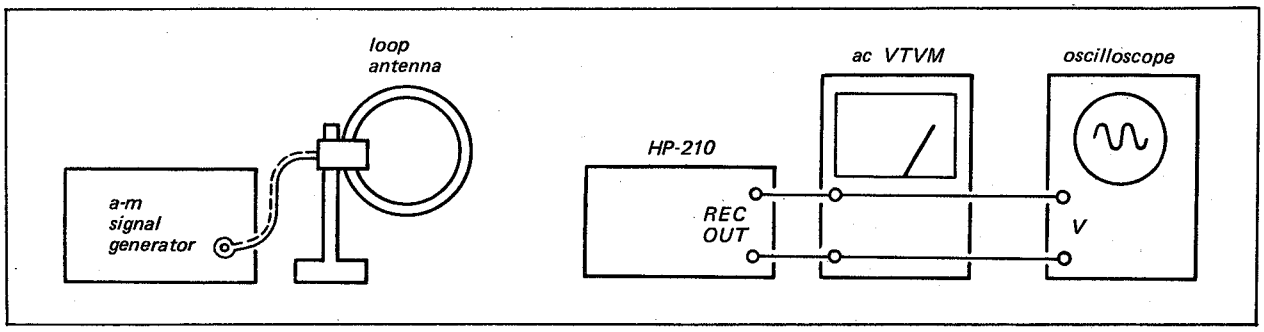


Fig. 3-16. Am frequency coverage and tracking alignment test setup

Signal Generator Method

Test Equipment Required

1. Signal generator
2. Loop antenna
3. Ac VTVM

Procedure

With the equipment connected as shown in Fig. 3-16, follow the procedures given in Tables 3-4 and 3-5 when performing this alignment with an a-m signal generator.

Off-the-Air Signal Method

Accurate dial calibration, and a frequency-coverage and tracking test can also be performed by utilizing off-the-air local a-m signals. However, before performing the following procedure, be sure that the dial is mechanically calibrated.

Frequency Coverage Alignment

1. Tune the receiver to the lowest-frequency station in your locality.
2. Check the dial scale for a calibration accuracy of ±15 kHz from the carrier frequency of the lowest and ±30 kHz at the highest station. If the dial-calibration error exceeds these limits, turn the local oscillator-coil L402 (shown in Fig. 3-11) slightly until optimum dial calibration is obtained.
3. Tune the receiver to the highest-frequency station in your locality. If the dial-calibration error is excessive, adjust local-oscillator trimmer-capacitor CT402 (see Fig. 3-11) to obtain maximum calibration accuracy.

TABLE 3-4. A-M FREQUENCY COVERAGE ALIGNMENT

SSG Coupling	SSG Frequency and Output Level	Tuner Dial Indication	Scope Connection	Adjust	Indication
Loop antenna	520 kHz 400 Hz 30% mod. 1,000 μV (60 dB)	lowest position	REC OUT	OSC coil L402 See Fig. 3-11	Maximum VTVM reading
Loop antenna	1,680 kHz Same as above	highest position	Same as above	OSC trimmer CT402 See Fig. 3-11	Same as above

TABLE 3-5. A-M TRACKING ALIGNMENT

SSG Coupling	SSG Frequency and Output Level	Tuner Dial Indication	Scope Connection	Adjust	Indication
Loop antenna	620 kHz 400 Hz 30% mod. Output level as low as possible	620 kHz	REC OUT	Position of antenna coil L401 See Fig. 3-11	Maximum VTVM reading
Loop antenna	1,400 kHz Same as above	1,400 kHz	Same as above	Antenna trimmer CT401 See Fig. 3-11	Same as above

Tracking Alignment

1. Tune the set to the station whose carrier frequency is closest to 620 kHz and adjust the position of antenna coil L401 as shown in Fig. 3-11 to obtain maximum output.
2. Tune the set to the station whose carrier frequency is closest to 1,400 kHz and adjust antenna trimmer CT401 to obtain maximum output. See Fig. 3-11.
3. Repeat the above steps two or three times.

3-6. POWER-AMPLIFIER ADJUSTMENTS

Note: There are two adjustments in the power amplifier. One is dc bias adjustment and the other is ac balance adjustment. These adjustments should be alternately repeated two or three times after replacing any of the power-amplifier transistors until the best operation is obtained.

Dc-Bias Adjustment

Serious deficiencies in performance, such as thermal runaway of power transistors, will result if this adjustment is improperly set.

CAUTION

To avoid accidental power transistor damage, increase the ac line voltage gradually, using a variable transformer, while measuring the voltage across the test points (emitter of Q508 to ground). See Fig. 3-17. Check to see that the reading does not exceed 15 mV. If it does, turn off the power as soon as possible, then check and repair the trouble in the power amplifier board.

Test Equipment Required

1. Dc millivoltmeter
2. Variable transformer
3. Screwdriver with 3 mm (1/8") blade

Preparation

1. Remove the record changer as described in Procedure 2-4.
2. Connect the dc millivoltmeter across the test points as shown in Fig. 3-17.

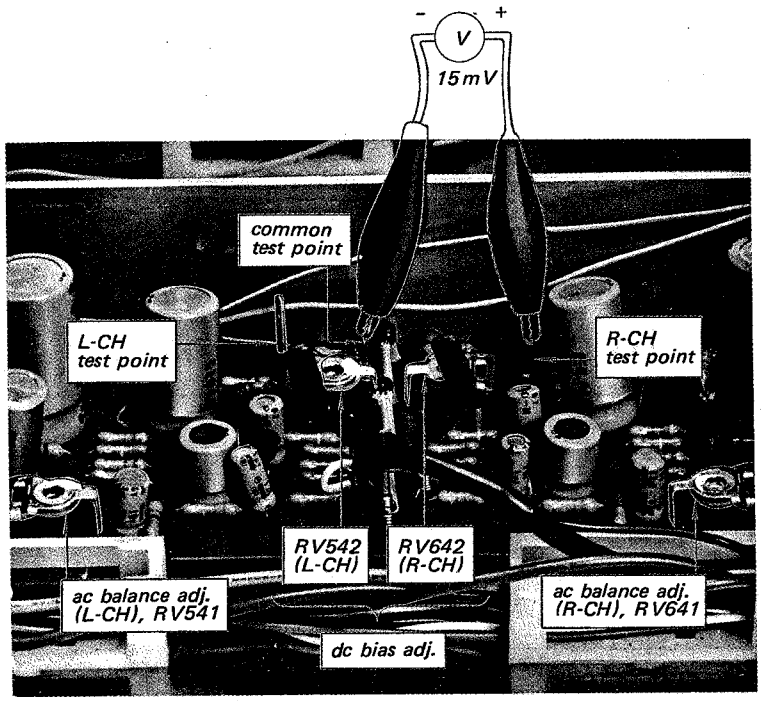


Fig. 3-17. Dc millivoltmeter connection and parts location

3. Set the semifixed resistors (Fig. 3-17) on the power-amplifier board as follows:

   RV542 (L-CH) (dc bias) ..... fully counter-clockwise.
   RV642 (R-CH) (dc bias) ..... fully counter-clockwise
   RV541, RV641 (ac balance) mid-position

4. Set the variable transformer for minimum output.

Procedure

1. Turn on the POWER switch, then increase the line voltage up to the rated value.
2. Adjust RV542 (RV642) to obtain a 15 mV reading on the meter.

Ac-Balance Adjustment

Excessive harmonic distoriton at high levels will result if this adjustment is improperly set.

Test Equipment Required

1. Audio oscillator
2. Attenuator
3. Oscilloscope
4. Resistor, 600Ω 1/4W
5. Dummy load, 8Ω 15W
6. Screwdriver with 3 mm (1/8") blade
7. Connecting Cord

Preparation

Set the receiver's controls as follows:

FUNCTION switch .....TAPE
VOLUME control .....Minimum
TONE control ..... mid position

Procedure

1. With the equipment connected as shown in Fig. 3-18, set the POWER switch to the ON position and feed a 1-kHz, 0.775-V (0 dB) signal to the TAPE input jack through the attenuator.
2. While watching the waveform on the oscilloscope, alternately turn the VOLUME control and adjust RV541 (RV641). Set RV541 (RV641) so that the positive and negative peaks of the output waveform are simultaneously clipped (as shown in Fig. 3-19) when increasing the VOLUME control just beyond the point that causes distortion.
3. Repeat the dc bias and ac balance adjustments two or three times.
4. After completing the adjustment, apply a drop of lock paint to RV541 (RV641) and RV542 (RV642).

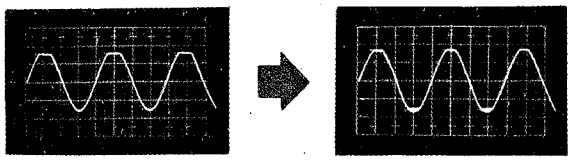


Fig. 3-19. Output waveform of ac balance adjustment

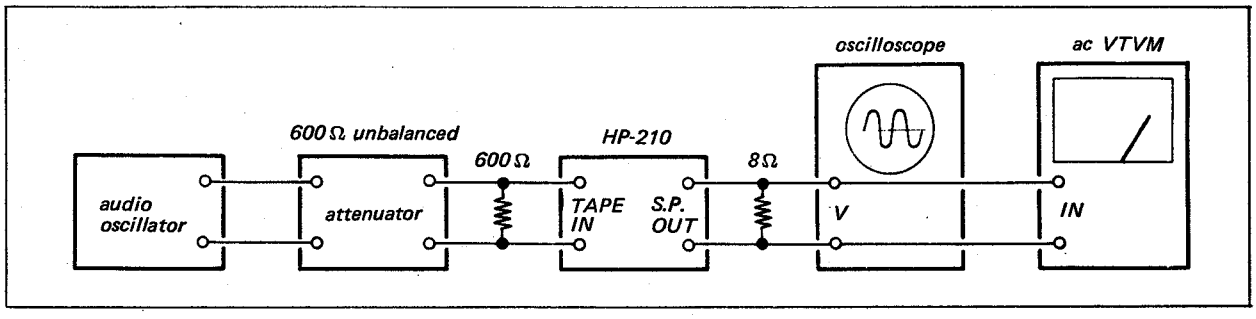


Fig. 3-18. Ac balance adjustment test setup

SECTION 4
RECORD-CHANGER AND SERVICING PROCEDURES

WARNING

Make sure that the HP-210's power cord is disconnected from the ac outlet before performing any of these procedures.

4-1. LINE-FREQUENCY CHANGE

The turntable can be adapted to operate at the alternate power-line frequency by changing the motor pulley. Refer to the list below to determine the part number of the proper pulley.

Note: Only the General Export Model, which has a four-pole drive motor with two field coils, can be adapted according to this procedure, otherwise replace the complete motor assembly.

Name	*Part Number*
50-Hz pulley (4-pole motor)	2-070-133
60-Hz pulley (4-pole motor)	2-070-132

1. Remove the record changer as described in Procedure 2-4.
2. Pull off the manual-play or automatic-play spindle from the turntable shaft.
3. Pry the nylon cover and ornamental disc off the platter with a small screwdriver.
4. Remove the platter by prying out the retaining ring around the shaft with a small screwdriver, as shown in Fig. 4-1.
5. Pull off the motor pulley while loosening the spring with long-nose pliers. If it is difficult to loosen the spring, take out the motor assembly by removing the three retaining rings and disconnecting the motor leads, then perform the motor-pulley removal.
6. Install the proper pulley and reassemble the changer.

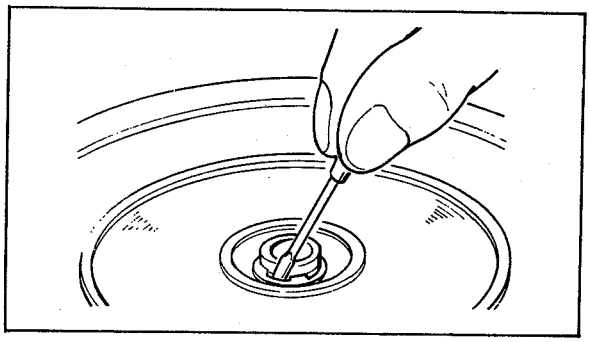


Fig. 4-1. Retaining-ring removal

4-2. LINE-VOLTAGE CHANGE

The general export model of the HP-210 can be adapted to operate at several different power-line voltages. The line-voltage change for the receiver is performed by removing and then appropriately plugging in the voltage selector. For the changer, the voltage change is made as follows:

1. Remove the record changer as described in Procedure 2-4.
2. Turn the changer upside down.
3. Remove the yellow caps, where the lead wires are connected, by turning them counter-clockwise.
4. Change the wiring to match the line-voltage as shown in Fig. 4-2.

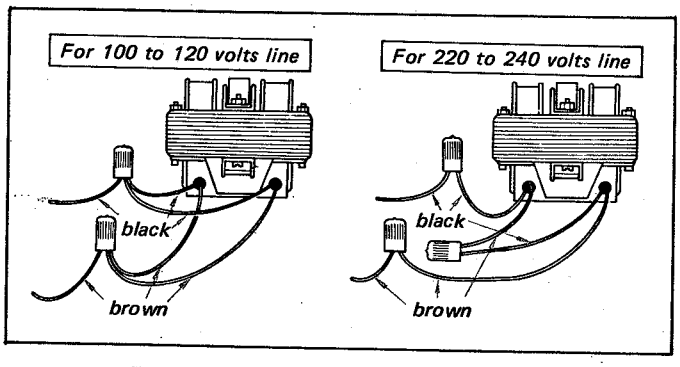


Fig. 4-2. Line-voltage change for motor

4-3. CARTRIDGE REPLACEMENT

1. Remove the screw (⊕ K 2.6x5) securing the cartridge mount to the shell head as shown in Fig. 4-3.
2. Remove the screw (⊕ K 2.6x5) securing the cartridge to the mount, and then install a new one. Refer to the wiring diagram when reinstalling the cartridge. See Fig. 4-4.

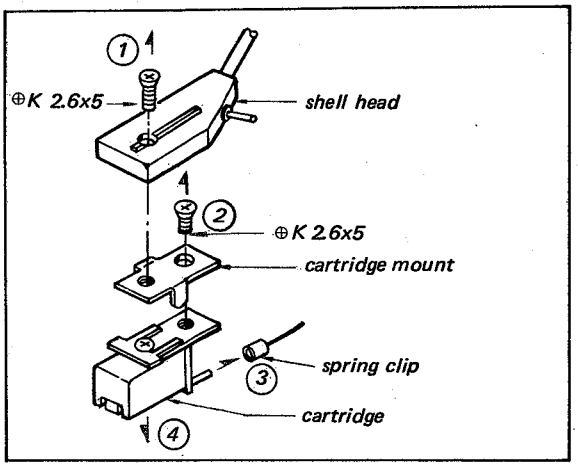


Fig. 4-3. Cartridge replacement

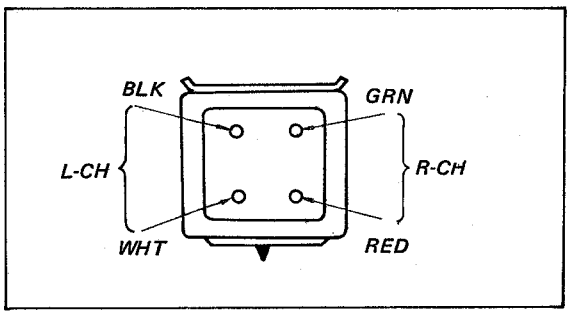


Fig. 4-4. Wiring diagram

4-4. STYLUS TIP REPLACEMENT

1. Remove the defective stylus tip with your fingers as shown in Fig. 4-5.
   Follow the sequence number as illustrated.
2. Install a new one.

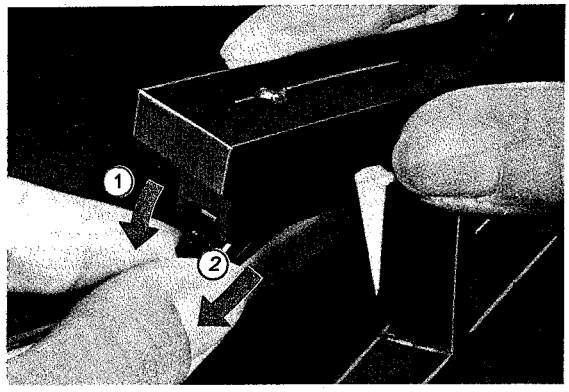


Fig. 4-5. Stylus replacement

4-5. STYLUS PRESSURE ADJUSTMENT

1. The stylus pressure should always be set to the recommended value of 4 grams which is indicated on the stylus pressure gauge as shown in Fig. 4-6.

Note: Adjustment procedures of record-changer are described in the BSR C-116 service manual supplied.

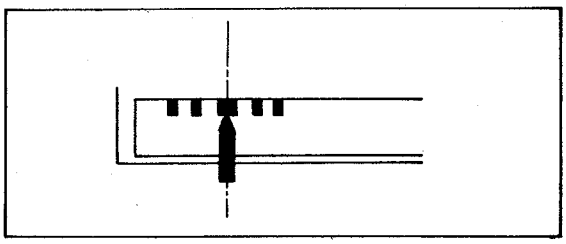


Fig. 4-6. Stylus pressure adjustment

SECTION 5
REPACKING

The HP-210's original shipping carton and packing materials are the ideal containers for shipping the unit. However to secure the maximum protection, the HP-210 must be repacked in these materials precisely as before. The proper repacking procedures are shown in Fig. 5-1.

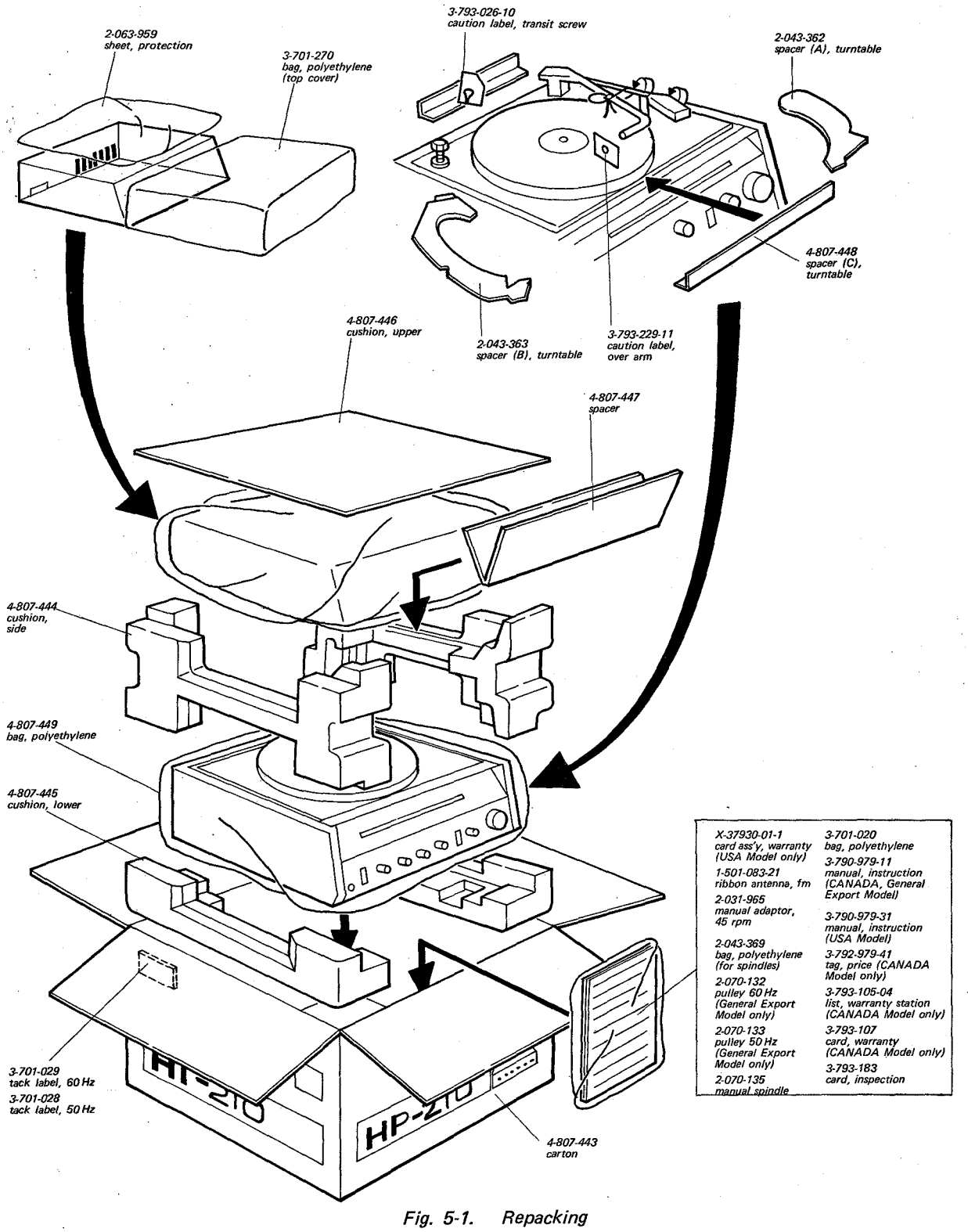
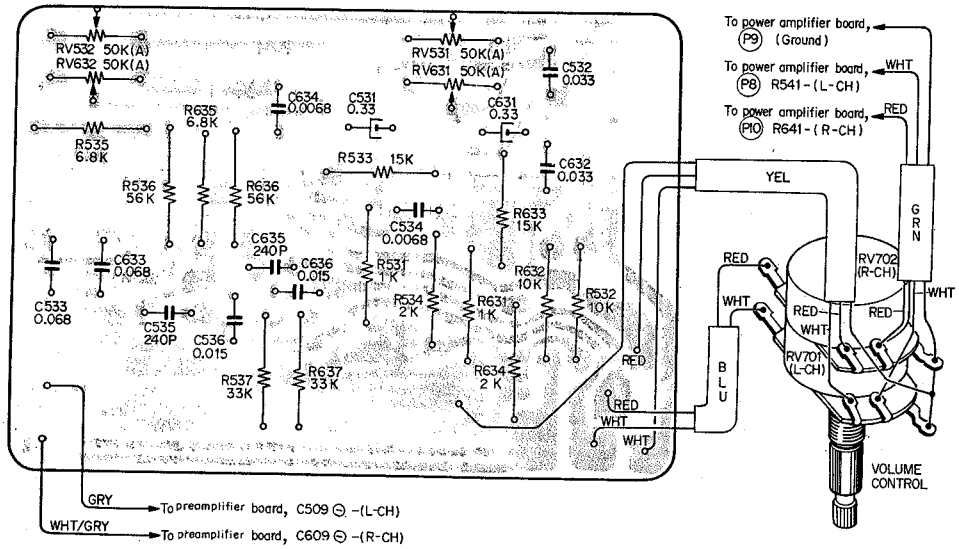


Fig. 5-1. Repacking

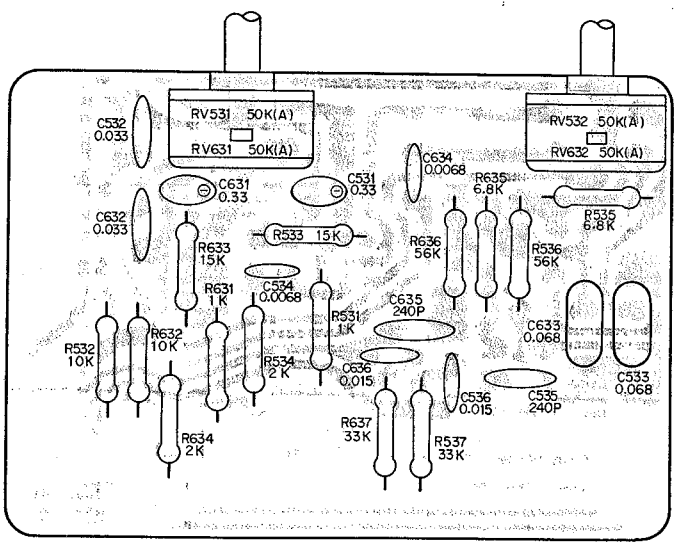
SECTION 6
DIAGRAMS

6-1. MOUNTING DIAGRAM – Tone Control Board –

– Conductor Side –

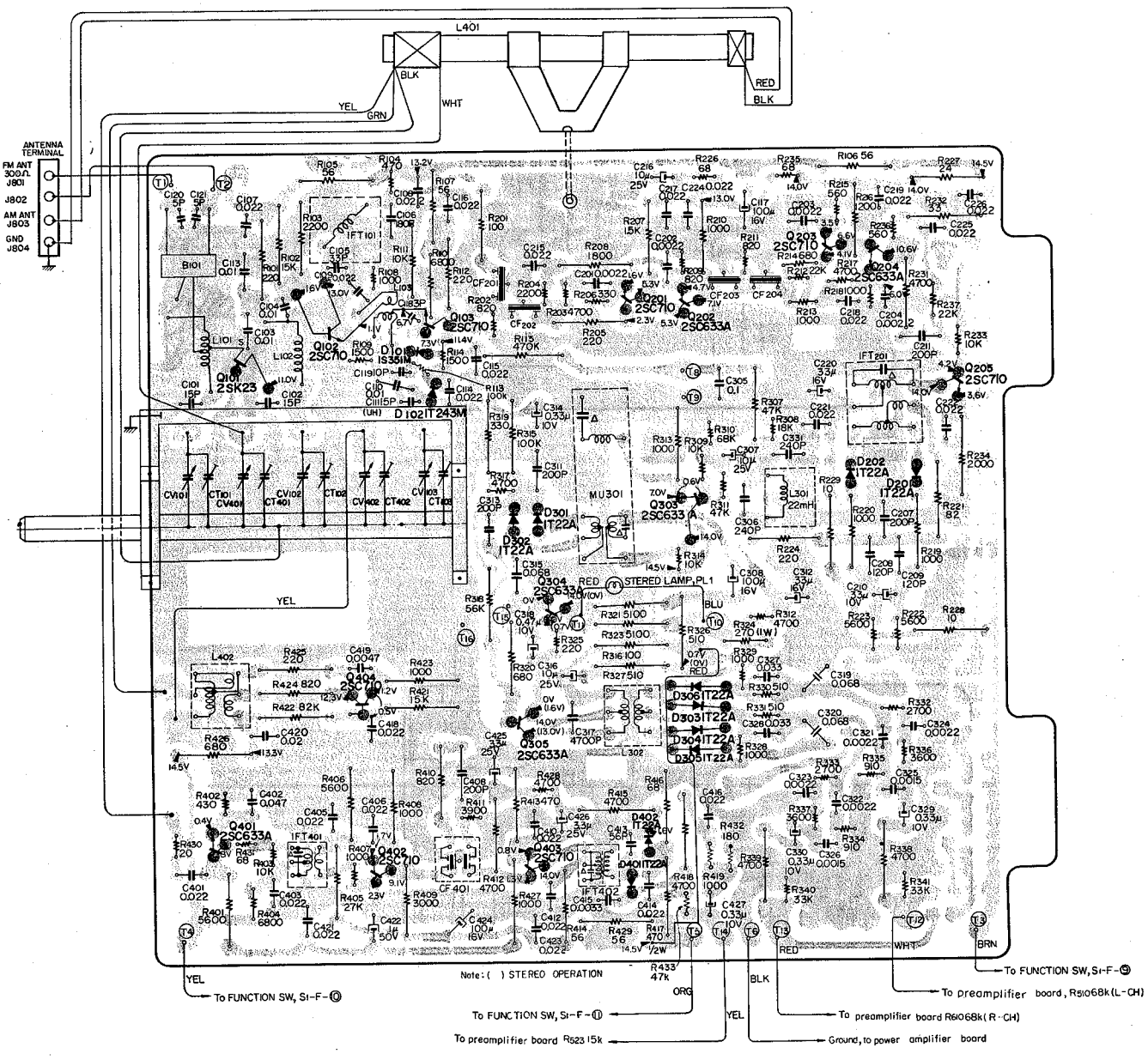


– Component Side –



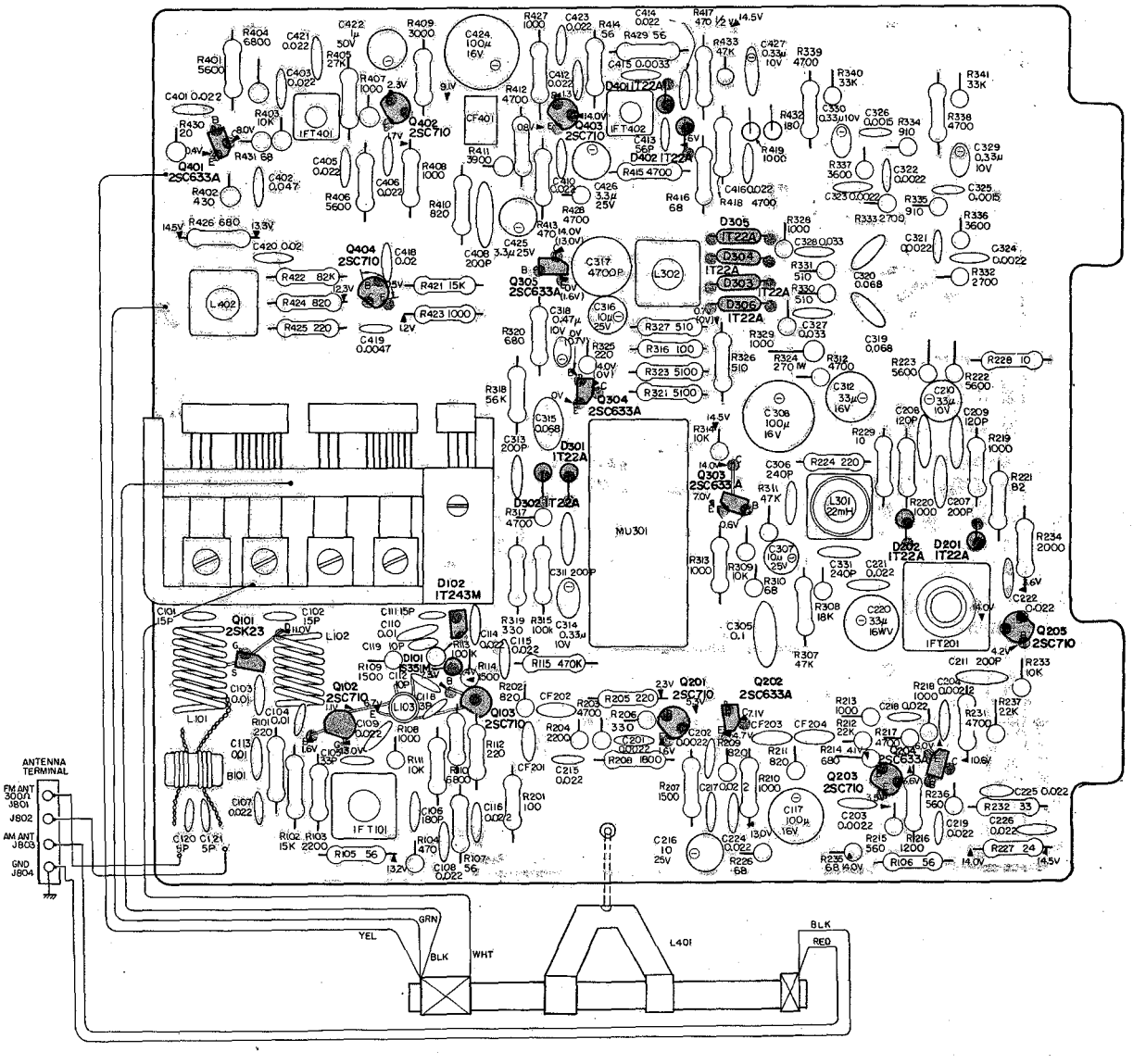
6-2. MOUNTING DIAGRAM — Tuner and MPX Board —

— Conductor Side —



6-2. MOUNTING DIAGRAM – Tuner and MPX Board –

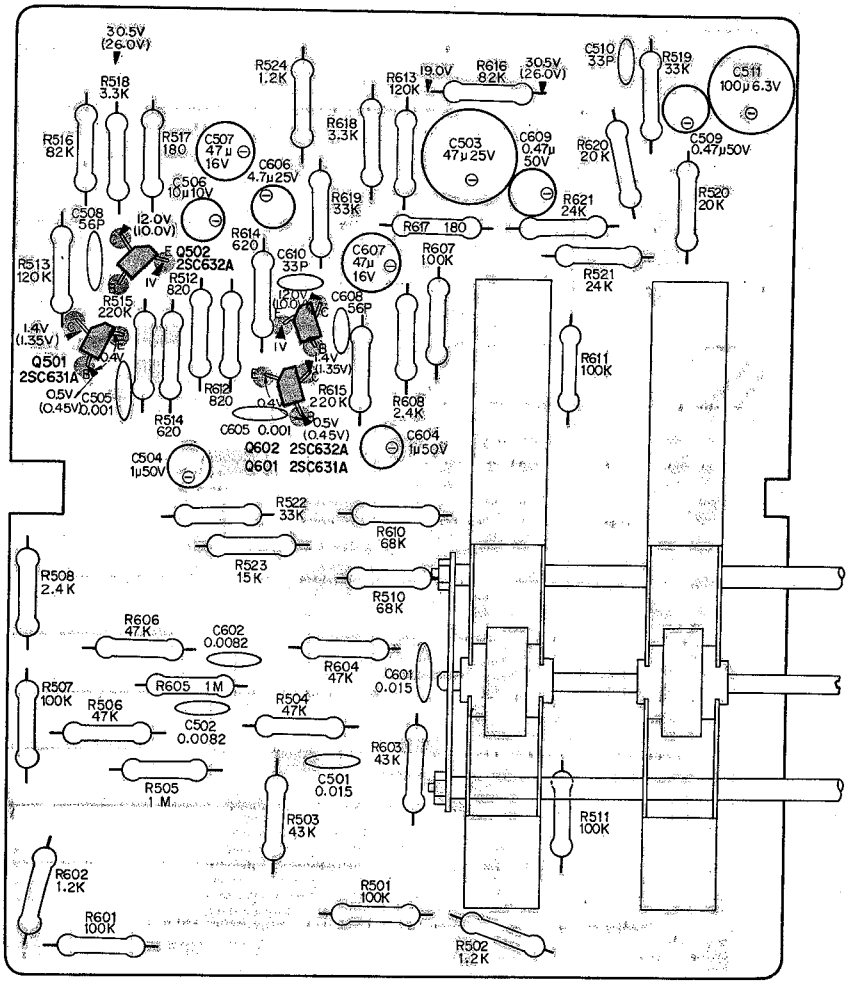
– Component Side –



Note: ( ) STEREO OPERATION

6-4. MOUNTING DIAGRAM – Preamplifier Board –

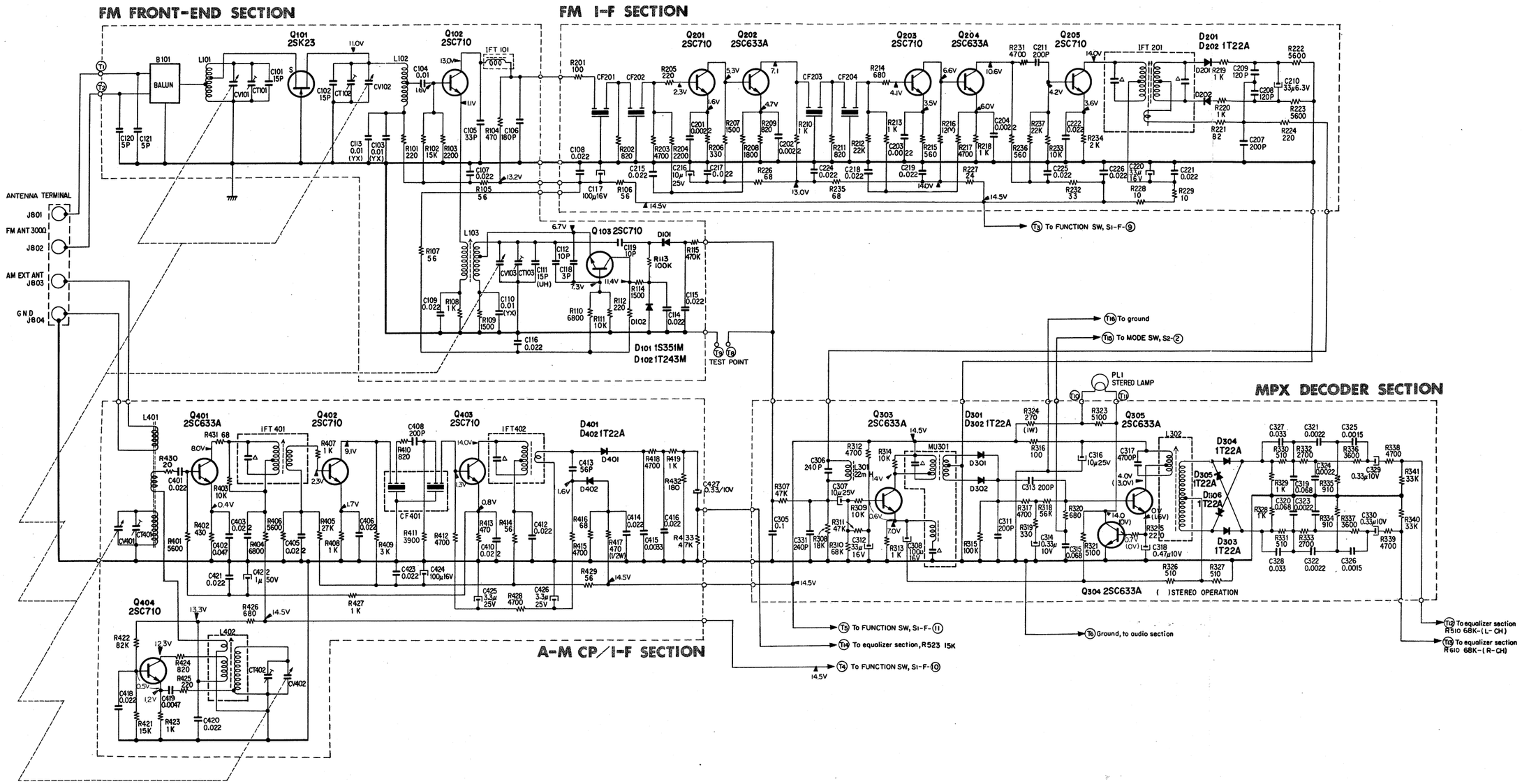
– Component Side –

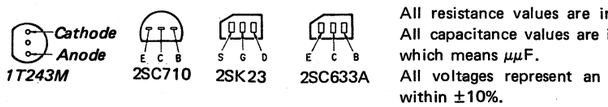


MEMO

6-5. SCHEMATIC DIAGRAM

— Tuner and MPX Section —





Note:

All resistance values are in ohms. k = 1,000, M = 1,000 k
All capacitance values are in μF except as indicated with p, which means μμF.
All voltages represent an average value and should hold within ±10%.
All voltages are dc measured with a VOM which has an input impedance of 20 k ohms/volt. No signal in.

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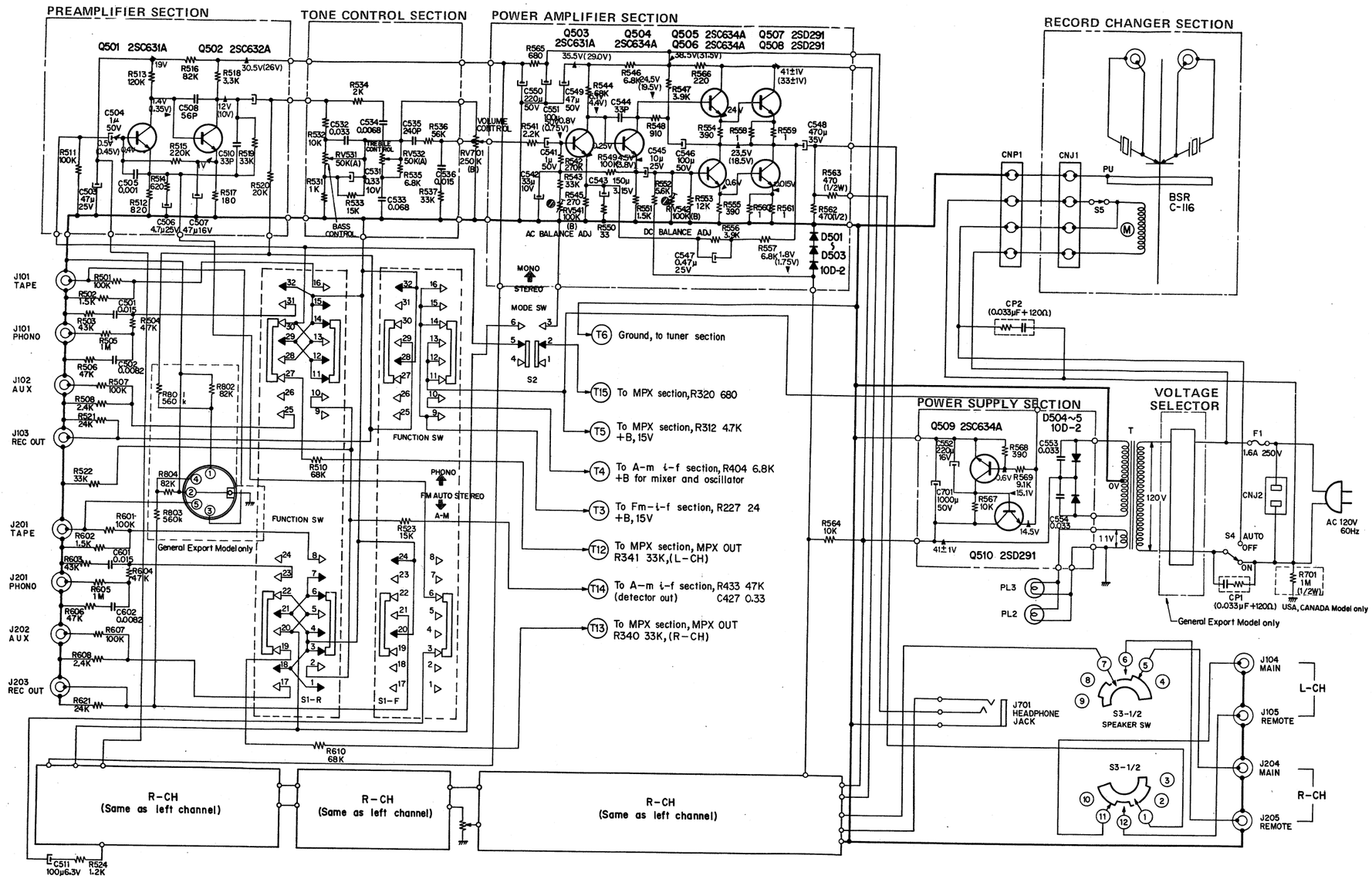
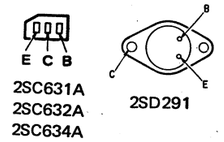
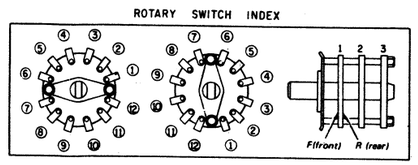
6-6. SCHEMATIC DIAGRAM

— Audio Amplifier Section —



Ref. No.	Description	Position	Ref. No.	Description	Position
S1	FUNCTION SELECTOR SW (AUX-AM-FM AUTO STEREO-PHONO-TAPE)	FM AUTO STEREO	S4	POWER SW (ON-OFF)	ON
S2	MODE SW (STEREO-MONO)	STEREO	S5	SLEEPING SW (ON-OFF)	ON
S3	SPEAKER SW (REMOTE-OFF-MAIN-BOTH)	MAIN			





Note:

All resistance values are in ohms. k = 1,000, M = 1,000 k
All capacitance values are in μF except as indicated with p, which means μμF.
All voltages represent an average value and should hold within ±10%.
All voltages are dc measured with a VOM which has an input impedance of 20 k ohms/volt. No signal in.
( ) are voltage at rated output.

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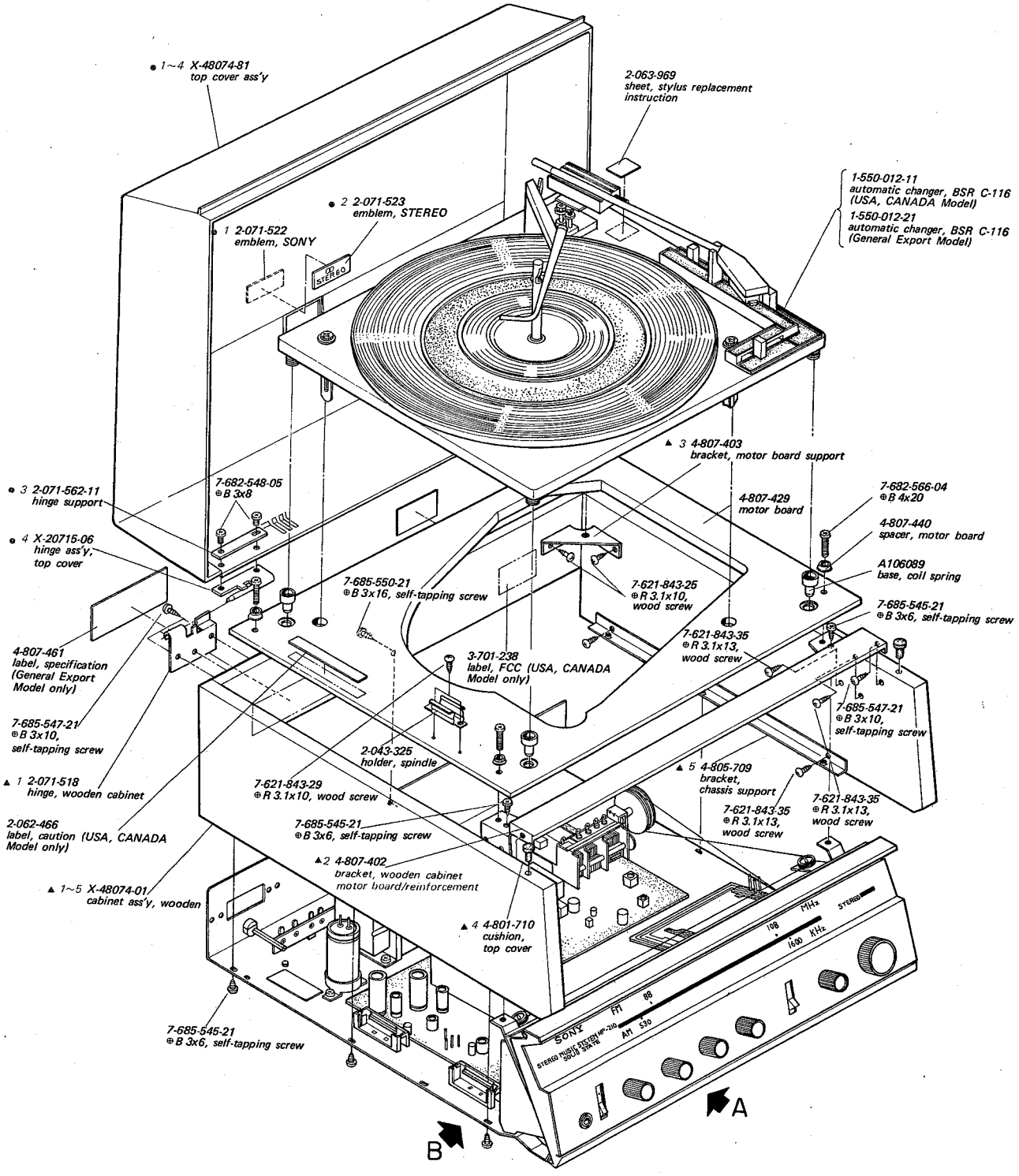
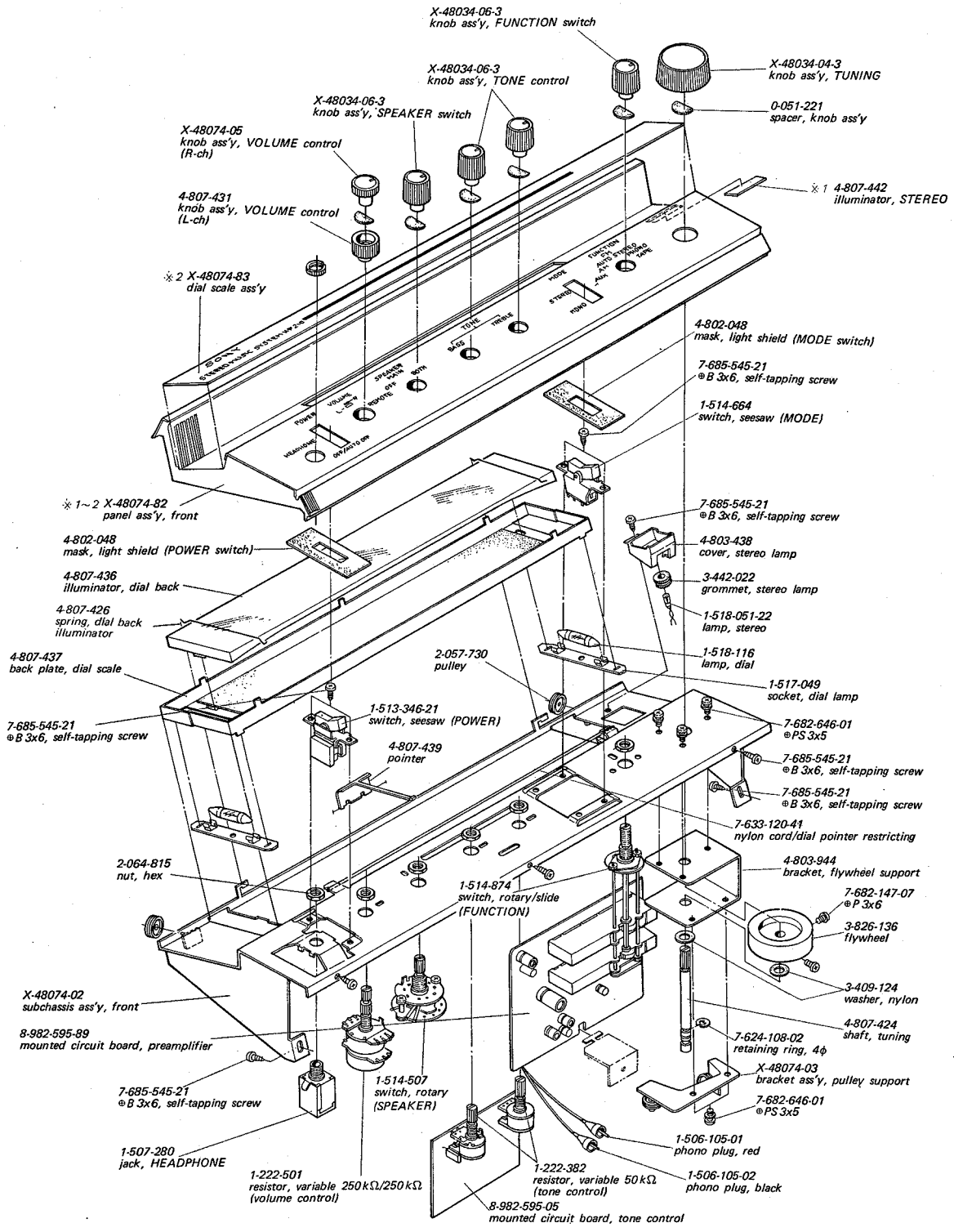
SECTION 7
EXPLODED VIEW

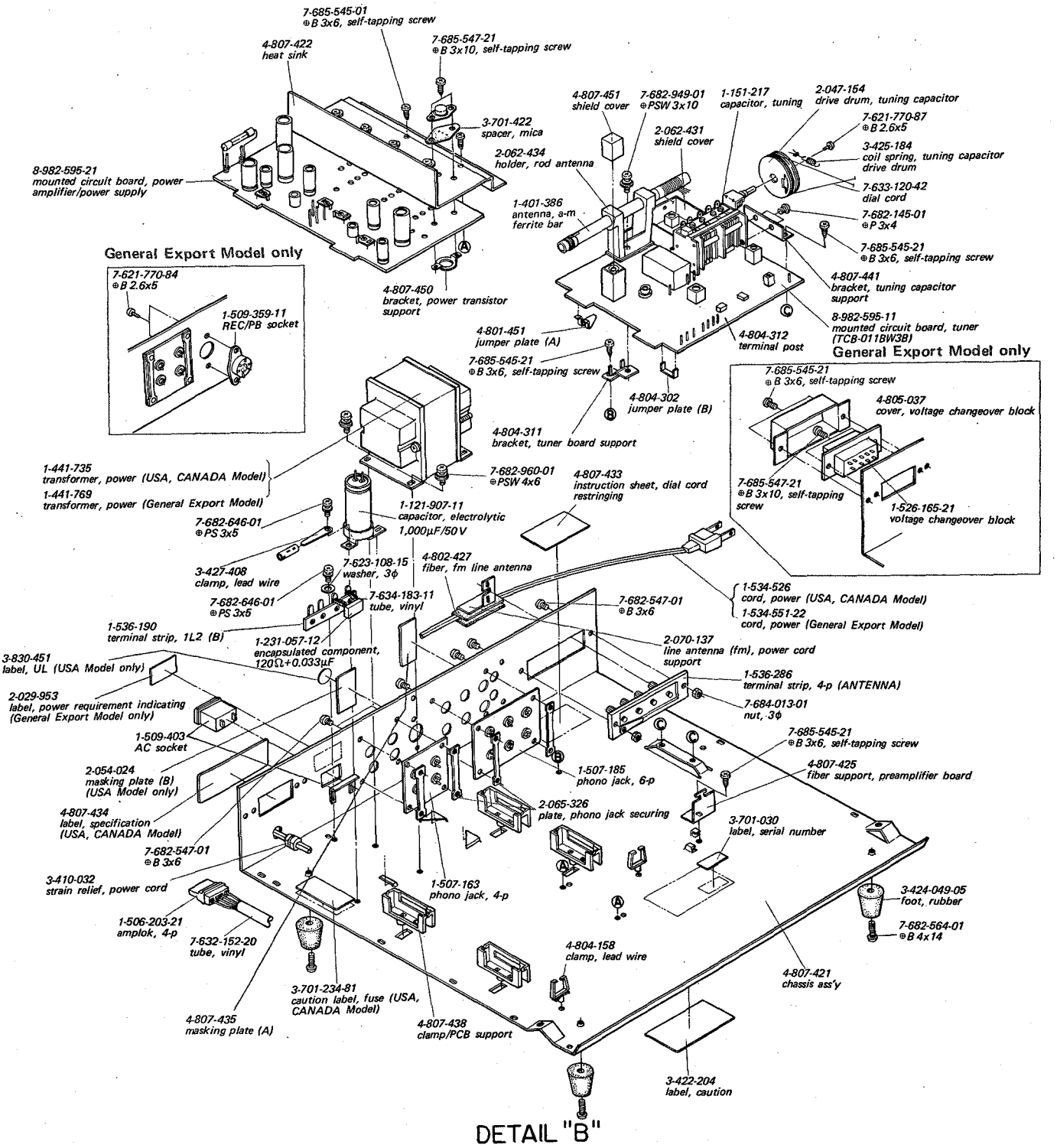


Note: ▲1～5 wooden cabinet ass'y (X-48074-01) includes all the parts marked ▲.
Note: ●1～4 top cover ass'y (X-48074-81) includes all the parts marked ●.



DETAIL "A" (COUNTER CLOCKWISE 75°)

Note: ※1~2 front panel ass'y (X-48074-82) includes all the parts marked ※.


7-685-545-01
⊕B 3x6, self-tapping screw
4-807-422
heat sink
7-685-547-21
⊕B 3x10, self-tapping screw
3-701-422
spacer, mica
2-062-434
holder, rod antenna
8-982-595-21
mounted circuit board, power amplifier/power supply
4-807-450
bracket, power transistor support
4-807-451
shield cover
7-682-949-01
⊕PSW 3x10
1-151-217
capacitor, tuning
2-047-154
drive drum, tuning capacitor
2-062-431
shield cover
7-621-770-87
⊕B 2.6x5
3-425-184
coil spring, tuning capacitor drive drum
7-633-120-42
dial cord
1-401-386
antenna, a-m ferrite bar
7-682-145-01
⊕P 3x4
7-685-545-21
⊕B 3x6, self-tapping screw
4-807-441
bracket, tuning capacitor support
8-982-595-11
mounted circuit board, tuner (TCB-011BW3B)
4-804-312
terminal post
4-801-451
jumper plate (A)
7-685-545-21
⊕B 3x6, self-tapping screw
4-804-302
jumper plate (B)
General Export Model only
7-621-770-84
⊕B 2.6x5
1-509-359-11
REC/PB socket
4-804-311
bracket, tuner board support
1-441-735
transformer, power (USA, CANADA Model)
1-441-769
transformer, power (General Export Model)
7-682-960-01
⊕PSW 4x6
4-807-433
instruction sheet, dial cord restringing
7-682-646-01
⊕PS 3x5
1-121-907-11
capacitor, electrolytic
1,000μF/50V
7-623-108-15
washer, 3φ
4-802-427
fiber, fm line antenna
3-427-408
clamp, lead wire
7-682-646-01
⊕PS 3x5
7-634-183-11
tube, vinyl
1-536-190
terminal strip, 1L2 (B)
1-231-057-12
encapsulated component, 120Ω+0.033μF
7-682-547-01
⊕B 3x6
1-534-526
cord, power (USA, CANADA Model)
1-534-551-22
cord, power (General Export Model)
2-070-137
line antenna (fm), power cord support
3-830-451
label, UL (USA Model only)
2-029-953
label, power requirement indicating (General Export Model only)
1-536-286
terminal strip, 4-p (ANTENNA)
7-684-013-01
nut, 3φ
1-509-403
AC socket
7-685-545-21
⊕B 3x6, self-tapping screw
2-054-024
masking plate (B) (USA Model only)
1-507-185
phono jack, 6-p
4-807-425
fiber support, preamplifier board
4-807-434
label, specification (USA, CANADA Model)
2-065-326
plate, phono jack securing
3-701-030
label, serial number
7-682-547-01
⊕B 3x6
3-410-032
strain relief, power cord
1-507-163
phono jack, 4-p
3-424-049-05
foot, rubber
1-506-203-21
amplok, 4-p
7-632-152-20
tube, vinyl
7-682-564-01
⊕B 4x14
4-804-158
clamp, lead wire
4-807-421
chassis ass'y
3-701-234-81
caution label, fuse (USA, CANADA Model)
4-807-435
masking plate (A)
4-807-438
clamp/PCB support
3-422-204
label, caution
General Export Model only
7-685-545-21
⊕B 3x6, self-tapping screw
4-805-037
cover, voltage changeover block
7-685-547-21
⊕B 3x10, self-tapping screw
1-526-165-21
voltage changeover block

DETAIL "B"

SECTION 8
ELECTRICAL PARTS LIST

MOUNTED CIRCUIT BOARDS

	8-982-595-05	tone control circuit board
	8-982-595-11	tuner circuit board, TCB-011BW3B
	8-982-595-21	power amplifier/power supply circuit board
	8-982-595-89	preamplifier circuit board

SEMICONDUCTORS

Ref. No.	Part No.	Description
D101		diode, 1S351M
D102		diode, 1T243M
D201		diode, 1T22A
D202		diode, 1T22A
D301		diode, 1T22A
D302		diode, 1T22A
D303		diode, 1T22A
D304		diode, 1T22A
D305		diode, 1T22A
D306		diode, 1T22A
D401		diode, 1T22A
D402		diode, 1T22A
D501		diode, 10D-2
D502		diode, 10D-2
D503		diode, 10D-2
D504		diode, 10D-2
D505		diode, 10D-2
Q101		FET, 2SK23
Q102		transistor, 2SC710
Q103		transistor, 2SC710
Q201		transistor, 2SC710
Q202		transistor, 2SC633A
Q203		transistor, 2SC710
Q204		transistor, 2SC633A
Q205		transistor, 2SC710
Q303		transistor, 2SC633A
Q304		transistor, 2SC633A
Q305		transistor, 2SC633A
Q401		transistor, 2SC633A
Q402		transistor, 2SC710
Q403		transistor, 2SC710
Q404		transistor, 2SC710
Q501 (Q601)		transistor, 2SC631A
Q502 (Q602)		transistor, 2SC632A
Q503 (Q603)		transistor, 2SC631A
Q504 (Q604)		transistor, 2SC634A
Q505 (Q605)		transistor, 2SC634A
Q506 (Q606)		transistor, 2SC634A
Q507 (Q607)		transistor, 2SD291
Q508 (Q608)		transistor, 2SD291
Q509		transistor, 2SC634A
Q510		transistor, 2SD291

TRANSFORMERS AND COILS

B101	1-417-025-12	balun
IFT101	1-403-556-21	IFT, 10.7 MHz
IFT201	1-403-291	transformer, discriminator 10.7 MHz
IFT401	1-403-152	IFT, 455 kHz
IFT402	1-403-128	IFT, 455 kHz
L101	1-401-391	coil, fm antenna
L102	1-425-547	coil, fm rf
L103	1-405-434	coil, fm osc.
L301	1-407-418	coil, SCA trap (22 mH)
L302	1-425-260	transformer, switching 38 kHz
L401	1-401-386	antenna, a-m ferrite bar
L402	1-405-391	coil, a-m osc.
MU301	1-425-548	MPX unit
T	1-441-735	transformer, power (USA, CANADA Model)
T	1-441-769	transformer, power (General Export Model)

CAPACITORS

All capacitance values are in μF except as indicated with p, which means μμF.

C101	1-102-951	15p	±5%	50V	ceramic
C102	1-102-951	15p	±5%	50V	ceramic
C103	1-101-004	0.01	$\pm^{100}_{0}$%	50V	ceramic
C104	1-101-923	0.01	$\pm^{80}_{20}$%	25V	ceramic
C105	1-102-963	33p	±5%	50V	ceramic
C106	1-102-982	180p	±10%	50V	ceramic
C107	1-101-924	0.022	$\pm^{80}_{20}$%	25V	ceramic
C108	1-101-924	0.022	$\pm^{80}_{20}$%	25V	ceramic
C109	1-101-924	0.022	$\pm^{80}_{20}$%	25V	ceramic
C110	1-101-004	0.01	$\pm^{100}_{0}$%	50V	ceramic
C111	1-102-996	15p	±5%	50V	ceramic
C112	1-102-947	10p	±5%	50V	ceramic
C113	1-101-004	0.01	$\pm^{100}_{0}$%	50V	ceramic
C114	1-101-924	0.022	$\pm^{80}_{20}$%	25V	ceramic

Ref. No.	Part No.	Description
C115	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C116	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C117	1-121-415	100 $\pm^{100}_{10}$% 16V electrolytic
C118	1-102-862	3p ±0.25pF 50V ceramic
C119	1-102-947	10p ±5% 50V ceramic
C120	1-102-942	5p ±0.5pF 50V ceramic
C121	1-102-942	5p ±0.5pF 50V ceramic
C201	1-101-919	0.0022 $\pm^{80}_{20}$% 25V ceramic
C202	1-101-919	0.0022 $\pm^{80}_{20}$% 25V ceramic
C203	1-101-919	0.0022 $\pm^{80}_{20}$% 25V ceramic
C204	1-101-919	0.0022 $\pm^{80}_{20}$% 25V ceramic
C207	1-102-977	200p ±5% 50V ceramic
C208	1-101-340	120p ±10% 50V ceramic
C209	1-101-340	120p ±10% 50V ceramic
C210	1-121-402	33 $\pm^{100}_{10}$% 10V electrolytic
C211	1-102-977	200p ±5% 50V ceramic
C215	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C216	1-121-398	10 $\pm^{100}_{10}$% 25V electrolytic
C217	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C218	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C219	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C220	1-121-403	33 $\pm^{100}_{10}$% 16V electrolytic
C221	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C222	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C224	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C225	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C226	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C305	1-105-685-12	0.1 ±10% 50V mylar
C306	1-107-140	240p ±10% 50V silvered mica
C307	1-121-398	10 $\pm^{100}_{10}$% 25V electrolytic
C308	1-121-415	100 $\pm^{100}_{10}$% 16V electrolytic
C311	1-102-977	200p ±5% 50V ceramic
C312	1-121-403	33 $\pm^{100}_{10}$% 16V electrolytic
C313	1-102-977	200p ±5% 50V ceramic
C314	1-127-021	0.33 ±20% 10V solid, aluminum
C315	1-105-683-12	0.068 ±10% 50V mylar
C316	1-121-398	10 $\pm^{100}_{10}$% 25V electrolytic
C317	1-103-575	4,700p ±5% 50V styrol
C318	1-127-022	0.47 ±20% 10V solid, aluminum
C319	1-105-683-12	0.068 ±10% 50V mylar
C320	1-105-683-12	0.068 ±10% 50V mylar
C321	1-105-665-12	0.0022 ±10% 50V mylar
C322	1-105-665-12	0.0022 ±10% 50V mylar
C323	1-105-665-12	0.0022 ±10% 50V mylar
C324	1-105-665-12	0.0022 ±10% 50V mylar
C325	1-105-663-12	0.0015 ±10% 50V mylar
C326	1-105-663-12	0.0015 ±10% 50V mylar
C327	1-105-679-12	0.033 ±10% 50V mylar
C328	1-105-679-12	0.033 ±10% 50V mylar
C329	1-127-021	0.33 ±20% 10V solid, aluminum
C330	1-127-021	0.33 ±20% 10V solid, aluminum
C331	1-107-140	240p ±10% 50V silvered mica
C401	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C402	1-105-681-12	0.047 ±10% 50V mylar
C403	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C405	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C406	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C408	1-103-708	200p ±5% 50V styrol
C410	1-105-677-12	0.022 ±10% 50V mylar
C412	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C413	1-101-884	56p ±5% 50V ceramic
C414	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C415	1-105-667-12	0.0033 ±10% 50V mylar
C416	1-105-677-12	0.022 ±10% 50V mylar
C418	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C419	1-105-669-12	0.0047 ±10% 50V mylar
C420	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C421	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C422	1-121-391	1 $\pm^{150}_{10}$% 50V electrolytic
C423	1-101-924	0.022 $\pm^{80}_{20}$% 25V ceramic
C424	1-121-415	100 $\pm^{100}_{10}$% 16V electrolytic
C425	1-121-392	3.3 $\pm^{150}_{10}$% 25V electrolytic
C426	1-121-392	3.3 $\pm^{150}_{10}$% 25V electrolytic
C427	1-127-021	0.33 ±20% 10V solid, aluminum
C501 (C601)	1-105-675-12	0.015 ±10% 50V mylar
C502 (C602)	1-105-672-12	0.0082 ±10% 50V mylar
C503	1-121-410	47 $\pm^{100}_{10}$% 25V electrolytic
C504 (C604)	1-121-391	1 $\pm^{150}_{10}$% 50V electrolytic
C505 (C605)	1-105-821-12	0.001 ±20% 50V mylar
C506 (C606)	1-121-395	4.7 $\pm^{150}_{10}$% 25V electrolytic
C507 (C607)	1-121-409	47 $\pm^{100}_{10}$% 16V electrolytic
C508 (C608)	1-101-885	56p ±10% 50V ceramic
C509 (C609)	1-121-726	0.47 $\pm^{150}_{10}$% 50V electrolytic
C510 (C610)	1-102-969	33p ±10% 50V ceramic
C511	1-121-413	100 $\pm^{100}_{10}$% 6.3V electrolytic
C531 (C631)	1-127-021	0.33 ±20% 10V solid, aluminum
C532 (C632)	1-105-679-12	0.033 ±10% 50V mylar
C533 (C633)	1-105-683-12	0.068 ±10% 50V mylar
C534 (C634)	1-105-671-12	0.0068 ±10% 50V mylar
C535 (C635)	1-107-140	240p ±10% 50V silvered mica
C536 (C636)	1-105-675-12	0.015 ±10% 50V mylar
C541 (C641)	1-121-391	1 $\pm^{150}_{10}$% 50V electrolytic
C542 (C642)	1-121-402	33 $\pm^{100}_{10}$% 10V electrolytic
C543 (C643)	1-121-741	150 ±20% 3.15V electrolytic
C544 (C644)	1-102-969	33p ±10% 50V ceramic
C545 (C645)	1-121-398	10 $\pm^{100}_{10}$% 25V electrolytic
C546 (C646)	1-121-417	100 $\pm^{100}_{10}$% 50V electrolytic
C547 (C647)	1-127-093	0.47 ±20% 25V solid, aluminum
C548 (C648)	1-121-361	470 $\pm^{100}_{10}$% 35V electrolytic
C549 (C649)	1-121-411	47 $\pm^{100}_{10}$% 50V electrolytic

Ref. No.	Part No.	Description			
C550	1-121-423	220	$\pm^{100}_{10}$%	50V	electrolytic
C551	1-121-417	100	$\pm^{100}_{10}$%	50V	electrolytic
C552	1-121-421	220	$\pm^{100}_{10}$%	16V	electrolytic
C553	1-105-879-12	0.033	±20%	100V	mylar
C554	1-105-879-12	0.033	±20%	100V	mylar
C701	1-121-907	1,000	$\pm^{100}_{10}$%	50V	electrolytic
CT101, CT102, CT103, CT401, CT402, CV101, CV102, CV103, CV401, CV402	1-151-217	capacitor, tuning			

RESISTORS

All resistance values are in Ω, ±5%, ¼W and carbon type unless otherwise indicated.

Ref. No.	Part No.	Description
R101	1-244-657	220
R102	1-244-701	15 k
R103	1-244-681	2.2 k
R104	1-242-665	470
R105	1-244-643	56
R106	1-244-643	56
R107	1-242-643	56
R108	1-242-673	1 k
R109	1-242-677	1.5 k
R110	1-244-693	6.8 k
R111	1-244-697	10 k
R112	1-244-657	220
R113	1-242-721	100 k
R114	1-242-677	1.5 k
R115	1-244-737	470 k
R201	1-244-649	100
R202	1-242-671	820
R203	1-242-689	4.7 k
R204	1-242-681	2.2 k
R205	1-244-657	220
R206	1-242-661	330
R207	1-244-677	1.5 k
R208	1-244-679	1.8 k
R209	1-242-671	820
R210	1-244-673	1 k
R211	1-242-671	820
R212	1-242-705	22 k
R213	1-242-673	1 k
R214	1-242-669	680
R215	1-242-667	560
R216	1-244-675	1.2 k
R217	1-242-689	4.7 k
R218	1-242-673	1 k
R219	1-244-673	1 k
R220	1-244-673	1 k
R221	1-244-647	82
R222	1-242-691	5.6 k
R223	1-242-691	5.6 k
R224	1-244-657	220
R226	1-242-645	68
R227	1-244-634	24
R228	1-244-625	10
R229	1-244-625	10
R231	1-244-689	4.7 k
R232	1-244-637	33
R233	1-242-697	10 k
R234	1-244-680	2 k
R235	1-242-645	68
R236	1-242-667	560
R237	1-242-705	22 k
R307	1-244-713	47 k
R308	1-242-703	18 k
R309	1-242-697	10 k
R310	1-242-717	68 k
R311	1-242-713	47 k
R312	1-242-689	4.7 k
R313	1-244-673	1 k
R314	1-242-697	10 k
R315	1-244-721	100 k
R316	1-244-649	100
R317	1-242-689	4.7 k
R318	1-244-715	56 k
R319	1-244-661	330
R320	1-242-669	680
R321	1-244-690	5.1 k
R323	1-244-690	5.1 k
R324	1-211-149	270 ±10% 1W
R325	1-242-657	220
R326	1-244-666	510
R327	1-244-666	510
R328	1-242-673	1 k
R329	1-242-673	1 k
R330	1-242-666	510
R331	1-242-666	510
R332	1-242-683	2.7 k
R333	1-242-683	2.7 k
R334	1-242-672	910

Ref. No.	Part No.	Description			
R335	1-242-672	910			
R336	1-242-686	3.6 k			
R337	1-242-686	3.6 k			
R338	1-244-689	4.7 k			
R339	1-244-689	4.7 k			
R340	1-242-709	33 k			
R341	1-242-709	33 k			
R401	1-244-691	5.6 k			
R402	1-242-664	430			
R403	1-242-697	10 k			
R404	1-242-693	6.8 k			
R405	1-244-707	27 k			
R406	1-244-691	5.6 k			
R407	1-242-673	1 k			
R408	1-244-673	1 k			
R409	1-244-684	3 k			
R410	1-244-671	820			
R411	1-242-687	3.9 k			
R412	1-244-689	4.7 k			
R413	1-244-665	470			
R414	1-244-643	56			
R415	1-244-689	4.7 k			
R416	1-244-645	68			
R417	1-202-565	470	±10%	½W	composition
R418	1-244-689	4.7 k			
R419	1-242-673	1 k			
R421	1-244-701	15 k			
R422	1-244-719	82 k			
R423	1-244-673	1 k			
R424	1-244-671	820			
R425	1-244-657	220			
R426	1-244-669	680			
R427	1-244-673	1 k			
R428	1-242-689	4.7 k			
R429	1-244-643	56			
R430	1-242-632	20			
R431	1-242-645	68			
R432	1-242-655	180			
R433	1-242-713	47 k			
R501 (R601)	1-244-721	100 k			
R502 (R602)	1-244-677	1.5 k			
R503 (R603)	1-244-712	43 k			
R504 (R604)	1-244-713	47 k			
R505 (R605)	1-244-745	1M			
R506 (R606)	1-244-713	47 k			
R507 (R607)	1-244-721	100 k			
R508 (R608)	1-244-682	2.4 k			
R510 (R610)	1-244-717	68 k			
R511 (R611)	1-244-721	100 k			

Ref. No.	Part No.	Description			
R512 (R612)	1-244-671	820			
R513 (R613)	1-244-723	120 k			
R514 (R614)	1-244-668	620			
R515 (R615)	1-244-729	220 k			
R516 (R616)	1-244-719	82 k			
R517 (R617)	1-244-655	180			
R518 (R618)	1-244-685	3.3 k			
R519 (R619)	1-244-709	33 k			
R520 (R620)	1-244-704	20 k			
R521 (R621)	1-244-706	24 k			
R522	1-244-709	33 k			
R523	1-244-701	15 k			
R524	1-244-675	1.2 k			
R531 (R631)	1-244-673	1 k			
R532 (R632)	1-244-697	10 k			
R533 (R633)	1-244-701	15 k			
R534 (R634)	1-244-680	2 k			
R535 (R635)	1-244-693	6.8 k			
R536 (R636)	1-244-715	56 k			
R537 (R637)	1-244-709	33 k			
R541 (R641)	1-244-681	2.2 k			
R542 (R642)	1-244-731	270 k			
R543 (R643)	1-244-709	33 k			
R544 (R644)	1-244-717	68 k			
R545 (R645)	1-244-659	270			
R546 (R646)	1-244-693	6.8 k			
R547 (R647)	1-244-687	3.9 k			
R548 (R648)	1-244-672	910			
R549 (R649)	1-244-721	100 k			
R550 (R650)	1-244-637	33			
R551 (R651)	1-244-677	1.5 k			
R552 (R652)	1-244-691	5.6 k			
R553 (R653)	1-244-699	12 k			
R554 (R654)	1-244-663	390			
R555 (R655)	1-244-663	390			
R556 (R656)	1-244-687	3.9 k			
R557 (R657)	1-244-693	6.8 k			
R558 (R658)	1-244-601	1			
R559 (R659)	1-244-601	1			
R560 (R660)	1-244-601	1			
R561 (R661)	1-244-601	1			
R562 (R662)	1-202-565-31	470	±20%	½W	composition
R563 (R663)	1-202-565-31	470	±20%	½W	composition
R564	1-244-697	10 k			
R565	1-244-669	680			
R566	1-244-657	220			
R567	1-244-697	10 k			
R568	1-244-663	390			
R569	1-244-696	9.1 k			
R701	1-202-645	1M	±20%	½W	composition
		(USA, CANADA Model only)			

Ref. No.	Part No.	Description
R801	1-244-539	560 k (General Export Model only)
R802	1-244-719	82 k (General Export Model only)
R803	1-244-539	560 k (General Export Model only)
R804	1-244-719	82 k (General Export Model only)
RV531 (RV631)	1-222-382	50 k (A), variable (tone control)
RV532 (RV632)	1-222-382	50 k (A), variable (tone control)
RV541 (RV641)	1-222-766	100 k (B), semi-fixed
RV542 (RV642)	1-222-766	100 k (B), semi-fixed
RV701 (RV702)	1-222-501	250 k (B), variable (volume control)

SWITCHES

S1	1-514-874	switch, rotary/slide (FUNCTION)
S2	1-514-664	switch, seesaw (MODE)
S3	1-514-507	switch, rotary (SPEAKER)
S4	1-513-346-21	switch, seesaw (POWER)

FILTERS

			(Color)	(Specified Center Freq.)
CF201	1-403-562-11	fm i-f ceramic	red	10.70 MHz
CF202	1-403-562-21	fm i-f ceramic	black	10.66 MHz
CF203	1-403-562-31	fm i-f ceramic	white	10.74 MHz
CF204	1-403-562-41	fm i-f ceramic	green	10.62 MHz
	1-403-562-51	fm i-f ceramic	yellow	10.78 MHz

Ref. No.	Part No.	Description
CF401	1-403-153-14	filter, ceramic 455 kHz

MISCELLANEOUS

1-231-057-12	encapsulated component, 120 Ω + 0.033 μF
1-506-105-01	phono plug, red
1-506-105-02	phono plug, black
1-506-203-21	amplok, 4-p
1-507-163	phono jack, 4-p
1-507-185	phono jack, 6-p
1-507-280	jack, HEADPHONE
1-509-359-11	REC/PB socket (General Export Model only)
1-509-403	AC socket
1-517-049	socket, dial lamp
1-518-051-22	lamp, stereo 4.5 V 40 mA
1-518-116	lamp, dial 11 V 0.36 A
1-526-165-21	voltage changeover block (General Export Model only)
1-532-250	fuse 1.6 A (General Export Model)
1-532-267	fuse 1.6 A (USA, CANADA Model)
1-534-526	cord, power (USA, CANADA Model)
1-534-551-22	cord, power (General Export Model)
1-536-190	terminal strip, 1L2 (B)
1-536-248	terminal post
1-536-286	terminal strip, 4-p (ANTENNA)
1-549-028	cartridge, VX-18 p (with the stylus)
1-549-030	stylus, ND-120 p
1-550-012-11	automatic changer, BSR C-116 (USA, CANADA Model)
1-550-012-21	automatic changer BSR C-116 (General Export Model)

BSR C-116

SONY®

SERVICE MANUAL

TABLE OF CONTENTS

Page

SECTION 1 OPERATING INSTRUCTIONS

1-1 Initial Preparation 3

1-2 Automatic Operation 3

1-3 Manual Operation ..... 3~4

SECTION 2 ADJUSTMENTS

2-1 Stylus Pressure 5

2-2 Pick-up Arm Bias Compensator 5

2-3 Stylus Set-down 5

2-4 Pick-up Arm Height 5

SECTION 3 TROUBLE CHART ..... 6~7

PARTS LIST AND EXPLODED VIEW ..... 8~12

SECTION 1
OPERATING INSTRUCTIONS

The BSR C-116 will play automatically a stack of up to five (depending on thickness) 7″, 10″ or 12″ diameter records of the same speed. 7″ diameter records having a large centre hole may be played using a BSR 45 rpm spindle adaptor.

1-1 Initial Preparation

(1) Check that the two transit screws are fully screwed down to the mainplate and that the unit floats freely on the mounting springs.

(2) Rotate the turntable by hand, five times to ensure that the mechanism is in neutral position.

(3) If the centre spindle is not already fitted, place it into the turntable bearing, ensuring that the projection on the spindle locates in the slot at the top of the turntable bearing. Press downwards until the spindle snaps onto the retaining clip.

Note: The pick-up arm is automatically released when the starting lever is operated.

1-2 Automatic Operation

(1) According to the type of record to be played,
  (a) Move the speed control (Fig. 1, A) against the required speed.
  (b) Set record size selector (Fig. 1, B).

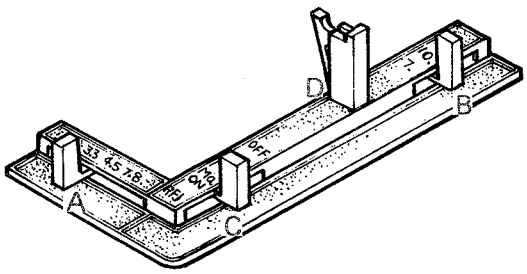


Fig. 1 Control Panel with Automatic Pick-up Lock

(2) To Load
Lift the control arm at the rear and swing it to the right. Carefully place one record on the ledge of the centre spindle and hold there while the remaining stack of up to seven records are also loaded.
All records in any one stack must be of the same speed, Automatic Operation diameter and have the same type of groove (i. e. standard or long playing). Swing the control arm back to the centre and gently lower onto the records.

(3) To Start
Move the starting lever (Fig. 1, C) to the REJ position and hold there momentarily until the turntable revolves, then let it return gently to the ON position.

(4) To Reject
To reject a record at any time when the unit is in operation, move the starting lever to the REJ position and then let it return gently to the ON position.

(5) To Stop
After playing the last record the unit will shut off automatically. If it becomes necessary to stop the unit during play, raise the cueing lever (Fig. 2) and move the pick-up arm above the pick-up rest (Fig. 1, D) lower the cueing lever and move the starting lever to the OFF position.

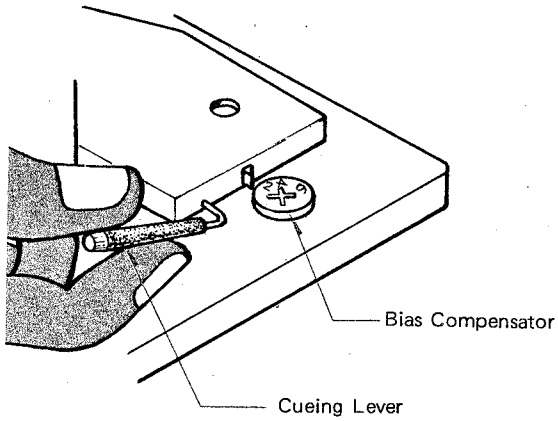


Fig. 2 Cueing Lever and Bias Compensator

Note: To interrupt the record, raise the cueing lever to lift the pick-up arm. When the cueing lever is lowered, the pick-up will descent to the record and resume playing in the same groove.

1-3 Manual Operation

(1) Check all settings as indicated in 1 (a) and (b) under Automatic Operation.

(2) Where a stub spindle is provided, remove centre spindle assembly by lifting and twisting and replace with the shorter spindle.

Note: Records may be played with the long spindle fixed, but the record must be manipulated carefully over the spindle ledge.

(3) Lift the control arm at the rear and swing to the right. Place the record on the turntable and replace the control arm in the playing position.

(4) To Start

Move the starting lever to the ON position and raise the cueing lever. Move the pick-up arm above the record to the selected point and lower to the groove by returning the lever to the rest position.

At the end of the record the pick-up will return to the rest and the unit will switch off.

(5) To Reject or Stop

The procedure for stopping or rejecting a record while playing is as described in paragraphs 4 and 5 under Automatic Operation.

Note: (a) Single records may be played semi-automatically by leaving the control arm in the raised position clear of the turntable then moving the starting lever to the REJ position, letting it return gently to the ON position. The pick-up will automatically set down on the record. If the control arm is left in the raised position the record will continue to play repeatedly. The unit will shut off and the pick-up return to its rest only if the control arm is lowered after the stylus has set down on the record.

(b) Records which do not have a starting or fast finishing groove must be played manually.

Important:

(1) Always remember to use the correct stylus on the pick-up. If the wrong one is in use it may not be apparent from the music, however, the stylus itself may become damaged by continuous playing on the wrong point.

(2) Never force the pick-up arm. This unit is robust but due to the featherweight action of the pick-up and the delicate balance required, any force will upset the adjustment.

(3) When playing new records a certain amount of fluff will gather on the stylus point. This should be carefully removed from time to time.

(4) Do not leave records on the unit when not in use ; store as recommended by the manufactures.

(5) If the unit is to be moved the transit screws should be raised to secure the unit to the motor board.

SECTION 2
ADJUSTMENTS

Note: This unit has been subjected to the most rigorous checks and tests before leaving the factory where all necessary adjustments have been made to ensure the satisfactory playing of records. The following information is provided, should it become necessary to make any minor adjustments.

2-1 Stylus Pressure

The stylus pressure should always be set as recommended by the cartridge manufacturer. The pressure is adjusted by means of the stylus pressure adjusting screw (Fig. 3). Turning clockwise increases the pressure, anti-clockwise reduces the pressure.

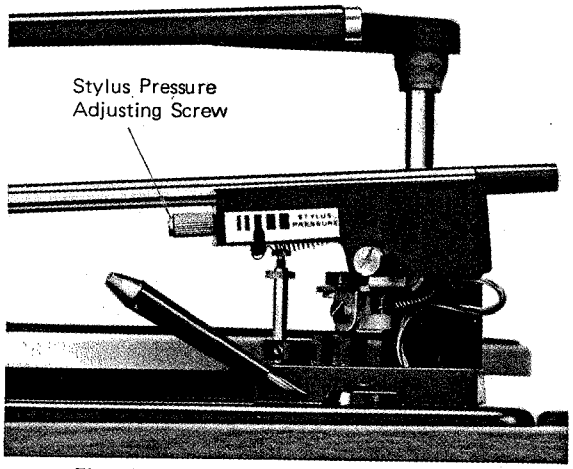


Fig. 3 Stylus Pressure Adjusting Screw

2-2 Pick-up Arm Bias Compensator

Having set the required stylus pressure, the bias compensator (Fig. 2) is adjusted to a figure corresponding to the stylus pressure applied. The control is continuously adjustable so settings between the figures indicated are possible.

Note: The bias compensator settings described are those required under ideal conditions. Slight variation from the optimum may be neccessary depending on the condition of the stylus. If, after setting the adjustment, the pick-up tends to skate out, lower the setting, if it skates in, increase the setting.

2-3 Stylus Set-down

The correct position for stylus set-down is 1/8″ from the edge of the record. The position is adjusted by the stylus adjusting screw (Fig. 4) and is best done with a stack of 10″ records on the turntable. When correctly positioned for a 10″ record the set-down will also be corrected for 7″ and 12″ records.

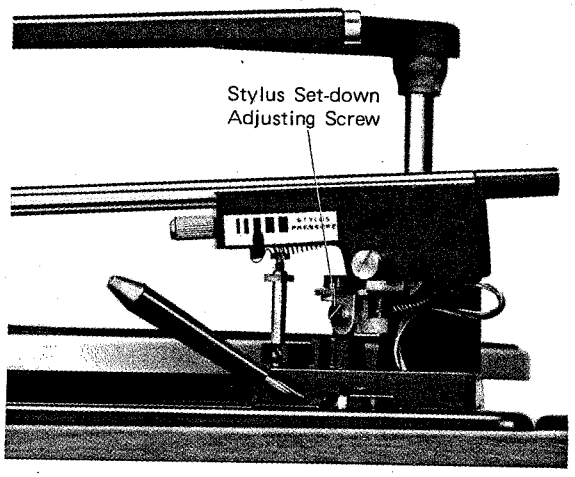


Fig. 4 Stylus Set-down Adjusting Screw

2-4 Pick-up Arm Height

The pick-up arm height is correctly adjusted when the stylus clears by 1/8″ the top of a stack of eight average thickness records on the turntable. The pick-up arm height may be raised by turning the pick-up height adjusting screw (Fig. 5) anti-clockwise and lowered by turning clockwise. After any adjustment a check must be made to ensure that the pick-up clears the underside of records held on the centre spindle ledge and also is secured by the automatic pick-up arm lock.

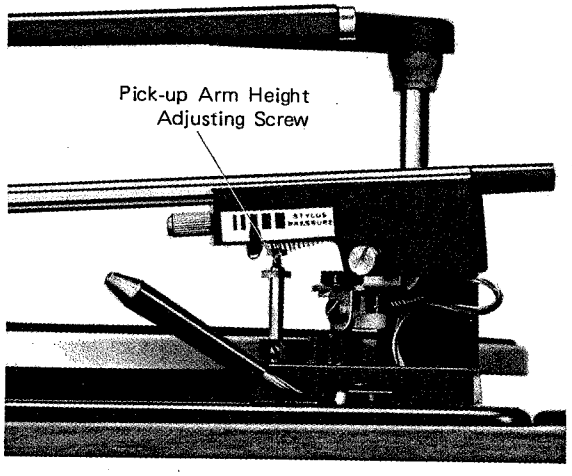
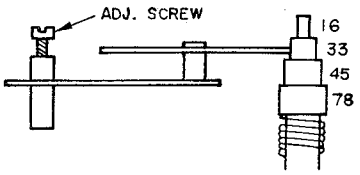


Fig. 5 Pick-up Arm Height Adjusting Screw

SECTION 3
TROUBLE CHART

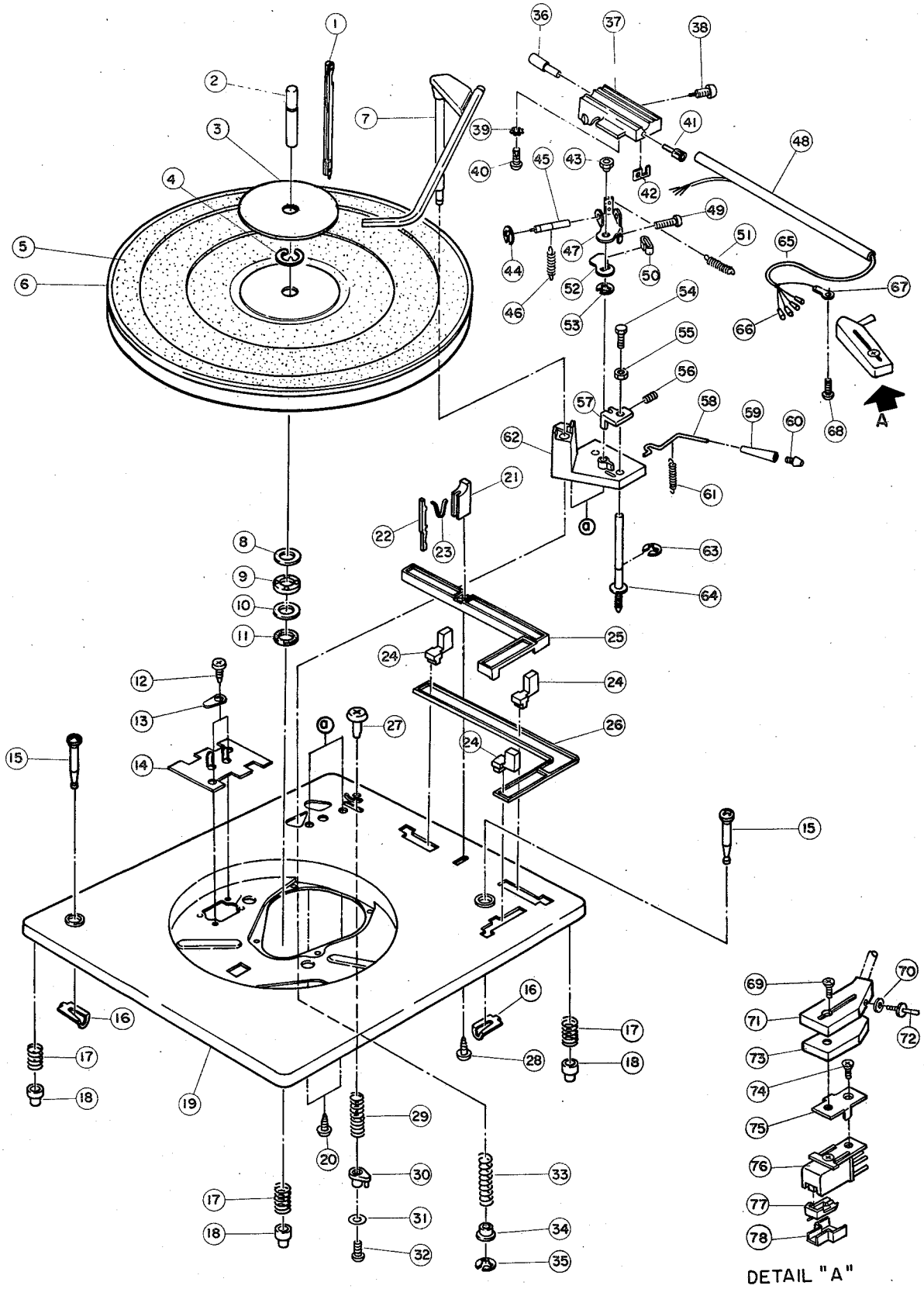
Symptom	Cause	Remedy
Turntable does not revolve when Reject Button is pushed to "ON".	1) No current to motor.	1) a) Check to see that current is reaching motor. b) Check that AC Cord is plugged into outlet. c) Check that 4-way connector is positively in place underneath changer.
	2) Idler pulley (105) not engaging turntable rim.	2) Check if the Idler arm is free to pivot: Check that tension spring (107) is properly positioned.
	3) Idler pulley (105) not driving.	3) Clean the inside rim of turntable and rubber tire of Idler pulley (105) to ensure that they are free from residue and oil.
Turntable revolves when Reject Button is pushed to "ON", but Tone Arm raises then returns to rest and changer shuts off.	Pick-up arm height adjustment.	1) Adjust height as described under "ADJUSTMENTS."
Turntable stops or slows down in middle of change cycle.	1) Idler pulley slips.	1) Clean the inside rim of turntable and rubber tire of idler pulley. These drive surfaces must be free from oil and residue.
	2) Insufficient tension on Idler pulley spring.	2) Check that spring (107) is properly positioned and not distorted.
Tone arm fails to move to position to play last record. Tone arm returns to rest and changer shuts off.	1) Control Arm (7) sticking or binding.	1) Free control arm by moving backward and forward several times.
Record fails to drop when changer cycles.	1) Bent or distorted record feed lever.	1) Replace spindle.
	2) Spindle not fully inserted.	2) Make sure spindle is locked in place and fully engaged.
Turntable speed too slow.	1) Light motor bearings.	1) Bearings are self-aligning lightly tap side of motor laminations to free bearings.
	2) Binding turntable bearings.	2) Check turntable bearings for freedom. If turntable does not turn easily when idler pulley is disengaged, remove turntable, clean off any accumulation of foreign matter, and lubricate bearings with light motor oil.
	3) Idler pulley slips.	3) Check that idler arm pivot (108) is free in speed change arm ass'y (98). Check that end of idler arm rivet ass'y is not binding on unit plate. Check proper tension of spring (107).
	4) Ambient temperature too low.	4) Prolonged exposure to temperatures of below 45° will result in slow initial speed.
	5) Idler wheel height adjustment incorrect.	5) Idler wheel adjustment. a) Disconect unit from A. C. supply. b) Remove turntable. c) Switch unit on, so that idler wheel is engaged against pulley. d) Set speed selector to 33.

Symptom	Cause	Remedy
		e) Using a screwdriver, turn adjustment screw higher or lower to position idler wheel in center of 33 step of motor pulley. f) Check alignment of wheel at all speeds and re-assemble turntable.
Tone arm strikes underside of record on spindle ledge, or stylus catches on top of last record while moving into playing position.	1) Incorrect tone arm height adjustment.	1) Adjust height as described under "ADJUSTMENTS."
Tone arm set-down on wrong portion of record.	1) Improper tone arm set-down adjustment.	1) Readjust tone arm "set-down" as outlined under "Adjustments."
Tone arm does not track correctly across record.	1) Stylus clogged with an accumulation of dust, of stylus badly worn. 2) Cartridge stereo cable leads too tight. 3) Changer mechanism not level. 4) Insufficient stylus pressure.	1) Check for foreign matter around top of stylus. Check for broken tip; replace if badly worn or broken. 2) Allow enough slack in cable to allow tone arm to move freely across record. 3) Check that changer is mounted in a LEVEL position before operating. 4) Adjust as outlined under "ADJUSTMENTS."
Changer fails to shut off after playing last record, and tone arm has returned to rest.	1) Voltage leads from supply input binding switch.	1) Re-dress leads away from switch and switch lever.
Noise during playing of record.	1) Motor rumble. 2) Defective idler pulley (105).	1) If a low pitched rumbling sound comes from the speaker, check rubber motor mounting to ensure the motor is finaling free. Motor leads should have enough slack to allow motor to float on its rubber mounting (112). 2) A rapid thumping sound while the motor is running is indicative of uneven wear on the rubber tire of idler pulley. Check for smooth surface of rubber tire; if surface is rough, replace idler pulley.
Two records drop together.	1) Hole in record too large. 2) Control arm not firmly seated (probably due to incorrect loading of records). 3) Control Arm (7) not holding records level.	1) Replace record. 2) Check control arm shaft for burrs and foreign matter carefully clean and remove any burrs. DO NOT OIL. It should fall in position from its own weight. 3) Gently twist control arm until it will hold record stack parallel to the top of turntable.

PARTS LIST

Ref. No.	Part No.	Description	Q'ty	
1	A10704300	Centre Spindle Ass'y	1	
2	A10617400	Stub Spindle	1	
3	B10602400	T.T. Centre Disc	1	
4	A10567800	Circlip	1	
5	C10675200	Turntable Mat	1	
6	C10709600	Turntable Final Ass'y	1	
7	B10808600	Control Arm Ass'y	1	
8	A10150600	Thrust Washer	1	
9	A10164900	Ballrace	1	
10	A10150600	Thrust Washer	1	
11	A10205800	Damping Washer	1	
12	A10651000	Screw, type Z, N° 6 x 1/4" S^{LTD} pan hd.	1	
13	A10235200	Solder Tag	1	
14	A10261600	Phono Socket	1	
15	A10418900	Transit Screw	1	
16	A10216600	Retaining Clip	2	
17	A10609000	Spring (Unit Mounting)	3	
18	A10908900	Spring Cup	3	
19	B10619000	Main Plate Sub Ass'y	1	
20	A10651000	Screw, type Z, N° 6 x 1/4" S^{LTD} pan hd.	1	
21	A10666300	Pick-up Rest	1	
22	A10666400	Pick-up Clip	1	
23	A10617300	Pick-up Rest Spring	1	
24	B10612200	Knob	3	
25	C10666700	Control Cover	1	
26	B10666100	Escutcheon	1	
27	B10681400	Anti-skate Control	1	
28	A10650700	Screw, type 25, 6-20 x 3/4" S^{LTD} hd.	1	
29	A10681300	Spring (Anti-skate Control)	1	
30	B10681500	Spring Anchor	1	
31	A10681600	Washer	1	
32	A10786300	Screw, type 25, 4-24 x 1/2" B hd.	1	
33	A10598500	Spring (Control Spindle)	1	
34	A10486100	Spacer	1	
35	A10210900	Circlip	1	
36	A10839900	Tube End	1	
37	A10852300	Pick-up Body Sub Ass'y	1	
38	A10665200	Screw (Pick-up Pivot)	1	
39	A10650400	6 B. A. lock washer	1	
40	A10750900	Screw, type 125, 4-24 x 5 1/16" pan hd. phpe, rec.	1	
41	A10834400	Balance Adjusting Screw	1	
42	A10834500	Balance Adjusting Plate	1	
43	A10562400	P. V. Spindle Nut	1	
44	A10620500	Circlip	1	
45	A10838100	Pick-up Pivot	1	
46	A10838200	Spring (Hinge Retainer)	1	
47	A10838400	Hinge Bracket Riveting Ass'y	1	
48	B10666000	Pick-up Tube	1	
49	A10691700	Screw 6 B. A. x 3/8" ch. hd. sled.	1	
50	A10604700	Locking Sleeve	1	
51	3-432-150-00	Pick-up Balance Spring	1	
52	A10665400	Pick-up Adjuster	1	
53	A10212800	Circlip	1	
54	A10571200	Adjusting Screw	1	
55	A10590700	Nut	1	
56	A10650500	Crub Screw 6 B. A. x 1/8	1	
57	A10666500	Raising Pad	1	
58	A10647400	Raising Arm	1	
59	A10647100	Knob	1	
60	A10647200	Cap	1	
61	A10647300	Spring	1	

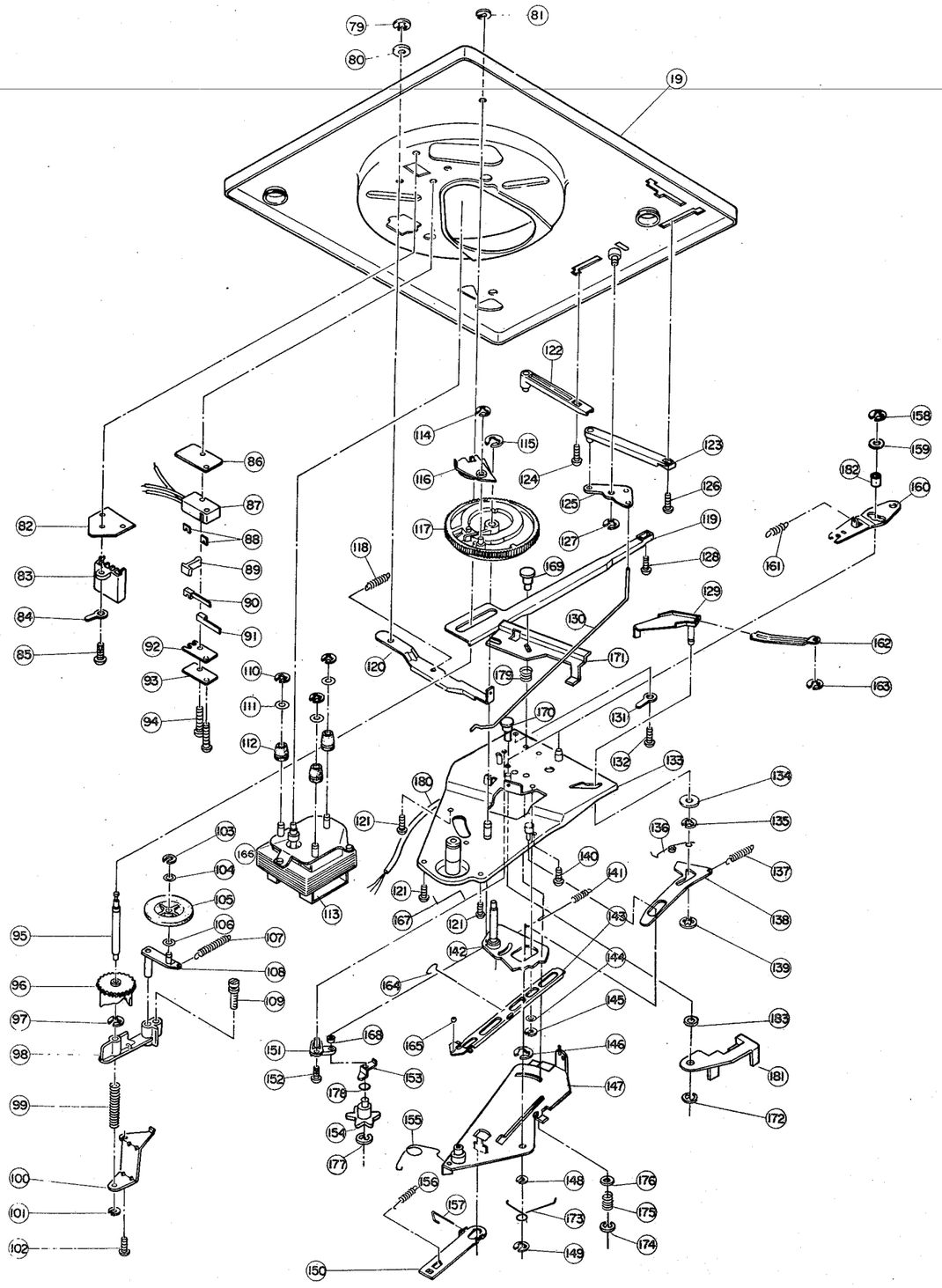
Exploded View



PARTS LIST

Ref. No.	Part No.	Description	Q'ty	
62	C10613800	Control Housing	1	
63	A10833400	Circlip	1	
64	A10669700	P. V. Raising Spindle Ass'y	1	
65	A10674500	23"-Quin P. U. Lead	1	
66	A10430600	Sleeve	4	
67	A10358700	Solder Tag	1	
68	A10765400	Screw, type 125, 4-24 x 1/4" rec. pan hd.		
69	7-621-559-38	⊕ RK 2.6x5	1	
70	A10212800	Circlip	1	
71	B10677600	Pick-up Head	1	
72	A10496400	Finger Lift	1	
73	2-063-968-00	Shield plate, cartridge	1	
74	7-621-559-38	⊕ RK 2.6x5	1	
75	2-063-948-00	Mounting bracket, cartridge	1	
76	1-549-028-11	Cartridge, VX-18P	1	
77	1-549-030-11	Stylus, ND-120P	1	
78	3-705-164-01	Cover, protecting	1	
79	A10210900	Circlip	1	
80	A10259500	Washer	1	
81	A10212800	Circlip		
82	A10486500	Insulating Strip	1	
83	A10309600	Amp Plug	1	
84	A10674900	4 B. A. tag lock washer	1	
85	A10526300	Screw, type 25, 6-20 x 3/8" B hd.	1	
86	A10601500	Retaining Strip	1	
87	B10818100	Switch Body	1	
88	A20044600	Solder Tag (2 off)	1	
89	A20045000	Switch Dolly	1	
90	A20044500	Contact (Flat)	1	
91	A20044400	Contact (Domed)	1	
92	A10818300	Switch Cover	1	
93	A10818200	Switch Cover	1	
94	A10741800	Screw, type 25, 4-24 x 3/4" B hd.	1	
95	A10858900	Raising Spindle	1	
96	B10611300	Raising Cam	1	
97	A10210900	Circlip	1	
98	A10742900	Speed Change Arm Ass'y	1	
99	A10583100	Spring (Raising Spindle)	1	
100	A10603400	Speed Change Bracket	1	
101	A10212800	Circlip	1	
102	A10651000	Screw, type Z, N° 6 x 1/4" B hd.	1	
103	A10076200	Circlip	1	
104	A10162000	Washer	1	
105	A10162300	Jockey Pulley Ass'y	1	
106	A10162000	Washer	1	
107	A10582400	Spring (Jockey Pulley) UA 50	1	
108	A10596500	Jockey Arm Riveting Ass'y	1	
109	A10561900	Adjusting Screw	1	
110	A10076200	Circlip (3 off)	1	
111	A10164600	Washer (3 off)	1	
112	A10218100	Rubber Mounting (3 off)	1	
113		T. P. 8/154 MOTOR Ass'y (USA, CANADA Model)	1	
		FP-10-9 MOTOR Ass'y (General Export Model)	1	
114	A10076200	Circlip	1	
115	A10211000	Circlip	1	
116	A10681900	Actuating Pawl Ass'y	1	
117	A10213300	Cam Gear Riveting Ass'y	1	
118	A10582600	Spring (Switch lever)	1	
119	B10811300	Speed Change Slide	1	
120	A10612900	Switch Lever	1	
121	A10651000	Screw, type Z, N° 6 x 1/4" B hd.	3	
122	B10614300	Selector Slide	1	

Exploded View



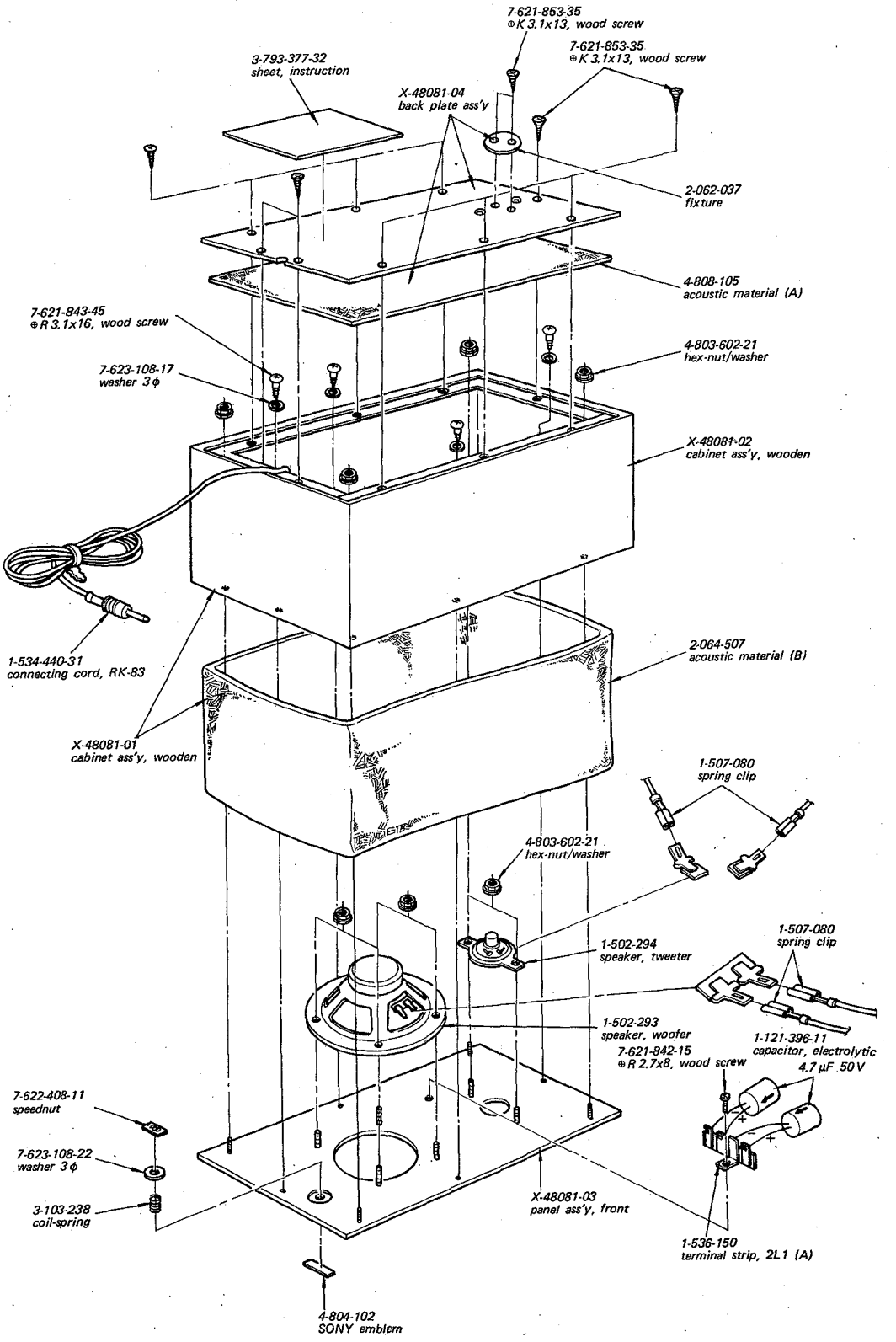
PARTS LIST

Ref. No.	Part No.	Description	Q'ty
123	B10611900	Reject Slide	1
124	A10526700	Screw, type 25, 4-24 x 5/16" B hd.	1
125	A10619300	Reject Plate Ass'y	1
126	A10526700	Screw, type 25, 4-24 x 5/16" B hd.	1
127	A10210900	Circlip	1
128	A10526700	Screw, type 25, 4-24 x 5/16" B hd.	1
129	A10828300	Reject Lever Ass'y	1
130	B10640500	Switch Link	1
131	A10212600	Solder Tag	1
132	A10651000	Screw, type Z, No 6 x 1/4" B hd.	1
133	C10810400	Main Sub Plate Riv. Ass'y	1
134	A10566000	Control Washer	1
135	A10076200	Circlip	1
136	A10662700	Detent Spring	1
137	A10262300	Spring (cut-off lever)	1
138	B10559200	Cut-off Lever	1
139	A10225100	Retainer	1
140	A10651000	Screw, type Z, No 6 x 1/4" B hd.	1
141	A10681200	Anti-skate Spring	1
142	B10808500	Quadrant Ass'y	1
143	B10696200	Actuating Slide	1
144	A10696600	Washer	1
145	A10407700	Circlip	1
146	A10152600	Circlip	1
147	B10816800	Operating Plate Riv. Ass'y	1
148	A10210900	Circlip	1
149	A10210900	Circlip	1
150	B10559700	Feed Lever Link	1
151	A10696500	Support Bracket	1
152	A10651200	Screw, type 25, 4-24 x 5/8" B hd.	1
153	A10700400	Support Spring	1
154	A10707700	Toggle Riveting Ass'y	1
155	A10698000	Spring (Operating Plate)	1
156	A10582700	Spring (Link Return)	1
157	A10696800	Spring (Feed Lever Link)	1
158	A10210900	Circlip	1
159	A10164600	Washer	1
160	A10803300	Detent Plate	1
161	A10807500	Spring	1
162	A10613400	Reject Link	1
163	A10210900	Circlip	1
164	A10590100	Spring (Actuating Slide)	1
165	A10741900	9/64" dia Ball Bearing	1
166	2-070-132	Motor Pulley, 60 Hz (General Export Model only)	1
	2-070-133	Motor Pulley, 50 Hz (General Export Model only)	1
167	A10488200	Retaining Clip	1
168	A10715400	3/32" dia Ball Bearing	1
169	A10806400	Slide Pin	1
170	A10806200	Selector Pivot	1
171	B10803600	Selector Lever	1
172	A10212800	Circlip	1
173	A10807800	Selector Drive Spring	1
174	A10078500	Circlip	1
175	A10807700	Spring	1
176	A10329000	Washer	1
177	A10076200	Circlip	1
178	A10865400	Spring Clip	1
179	A10808300	Cut-off Slide Spring	1
180	A10840100	7"-3MM. P. V. C. Sleeving	1
181	A10803000	Cut-off Slide	1
182	A10846100	Roller	1
183	A10162000	Washer	1

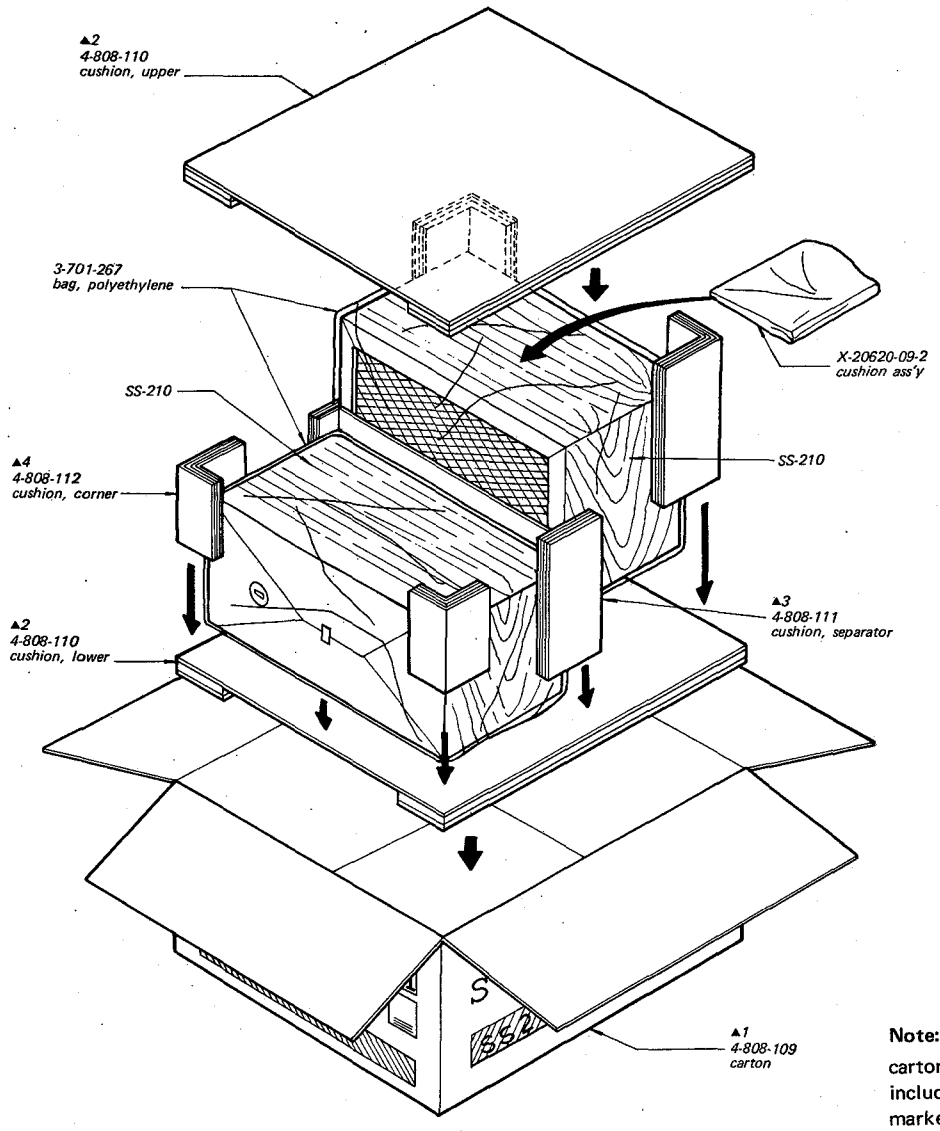
SONY®

EXPLODED DIAGRAM

Model SS-210

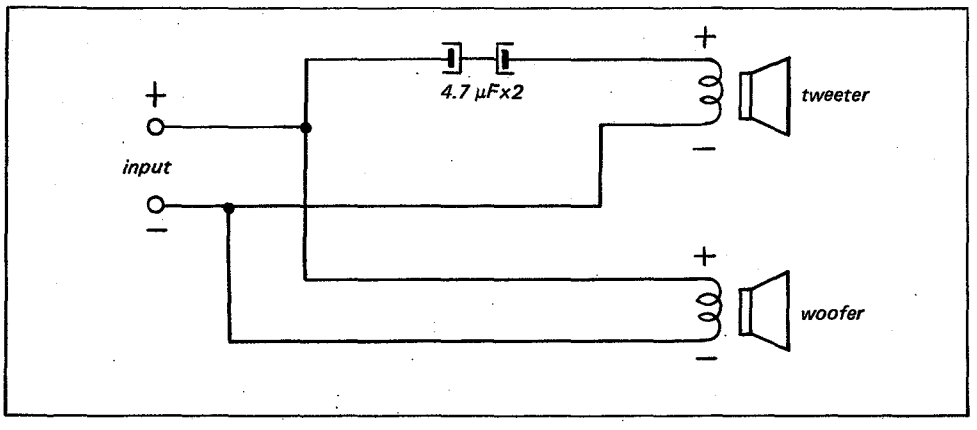


REPACKING



Note:
carton ass'y (X-48081-04) includes all the parts marked ▲.

SCHEMATIC DIAGRAM

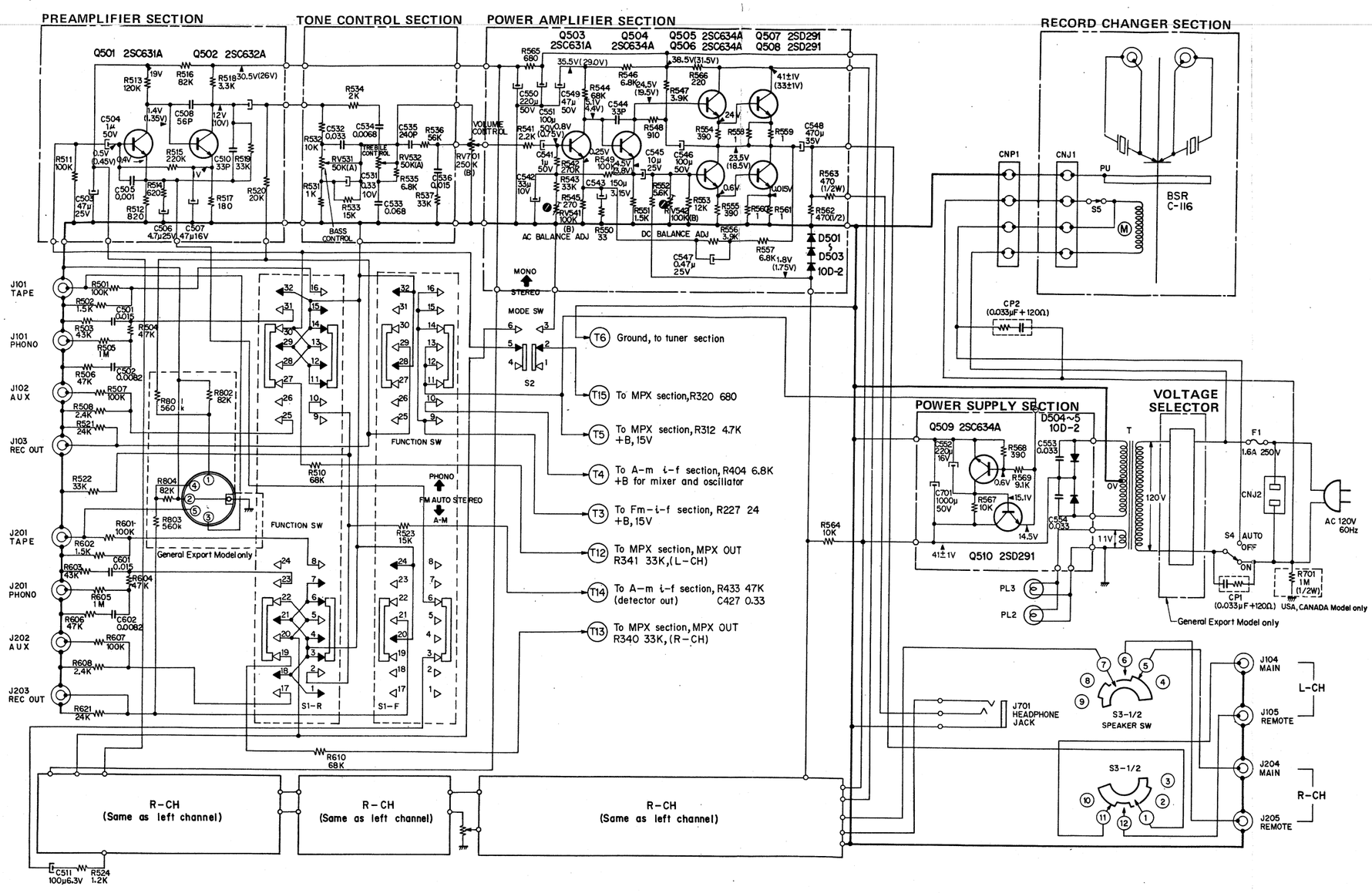


SONY CORPORATION

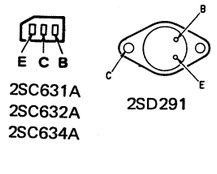
Printed in Japan

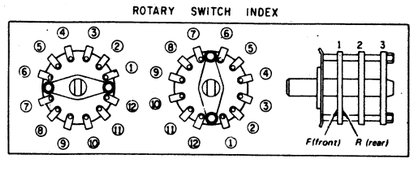
SCHEMATIC DIAGRAM

— Audio Amplifier Section —



Ref. No.	Description	Position	Ref. No.	Description	Position
S1	FUNCTION SELECTOR SW (AUX-AM-FM AUTO STEREO-PHONO-TAPE)	FM AUTO STEREO	S4	POWER SW (ON-OFF)	ON
S2	MODE SW (STEREO-MONO)	STEREO	S5	SLEEPING SW (ON-OFF)	ON
S3	SPEAKER SW (REMOTE-OFF-MAIN-BOTH)	MAIN			





Note:

All resistance values are in ohms. k = 1,000, M = 1,000 k
All capacitance values are in μF except as indicated with p, which means μμF.
All voltages represent an average value and should hold within ±10%.
All voltages are dc measured with a VOM which has an input impedance of 20 k ohms/volt. No signal in.
( ) are voltage at rated output.

SONY
HP-210

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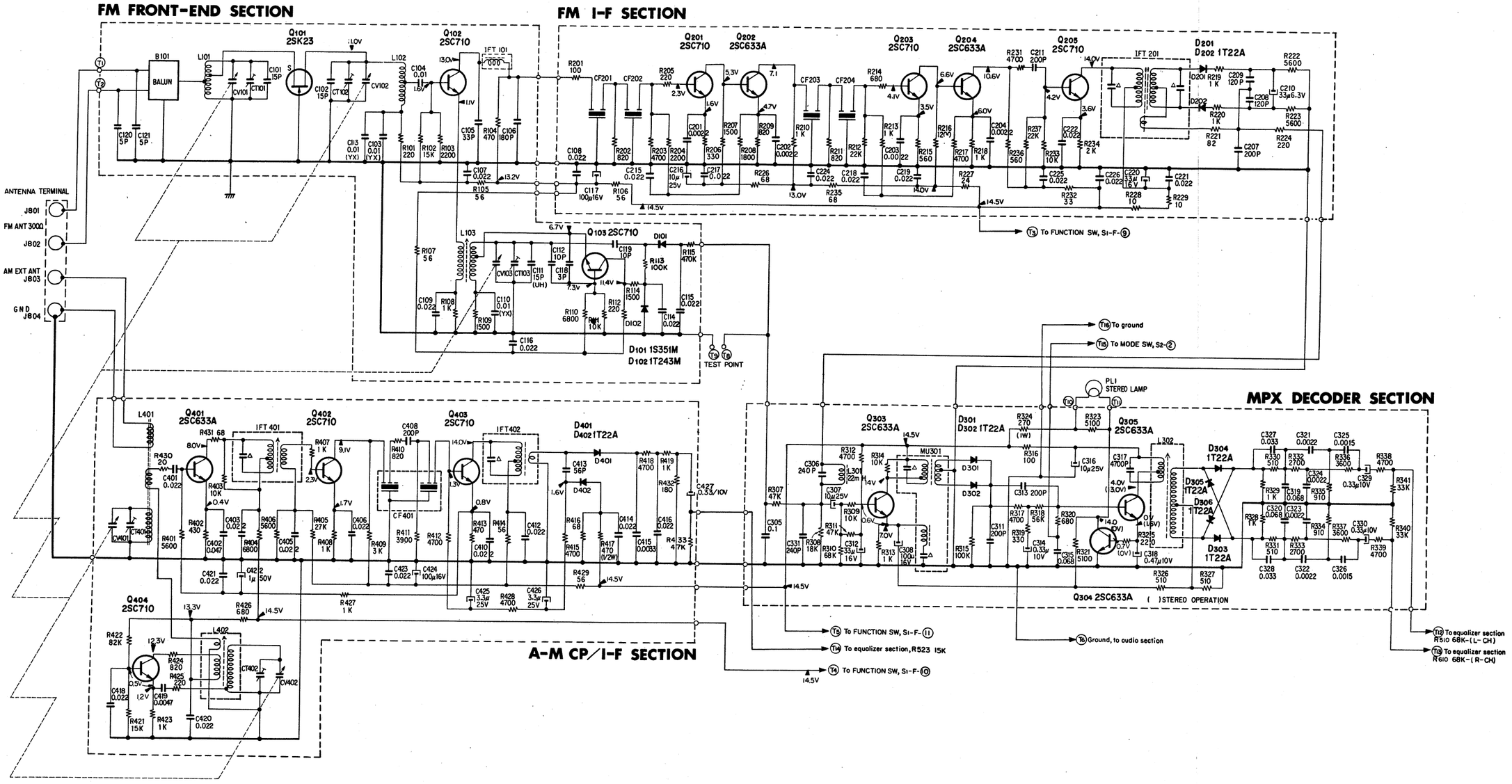
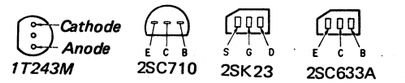
SCHEMATIC DIAGRAM

— Tuner and MPX Section —





Note:

All resistance values are in ohms. k = 1,000, M = 1,000 k
All capacitance values are in μF except as indicated with p, which means μμF.
All voltages represent an average value and should hold within ±10%.
All voltages are dc measured with a VOM which has an input impedance of 20 k ohms/volt. No signal in.